TECHNICAL SUPPORT FOR
ROCKY MOUNTAIN ARSENAL

FINAL
HUMAN HEALTH EXPOSURE ASSESSMENT FOR ROCKY MOUNTAIN ARSENAL STUDY AREA EVALUATIONS VOLUME VI-E CENTRAL STUDY AREA EXPOSURE ASSESSMENT VERSION 4.1

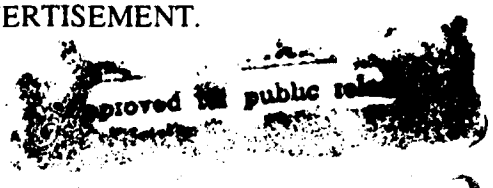
SEPTEMBER 1990
CONTRACT NO. DAAA15-88-D-0024
RIFS2

Prepared by:

EBASCO SERVICES INCORPORATED
Applied Environmental, Inc.
CH2M HILL
DataChem, Inc.
R.L. Stollar and Associates

Prepared for:

U.S. ARMY PROGRAM MANAGER'S OFFICE
FOR THE ROCKY MOUNTAIN ARSENAL CONTAMINATION CLEANUP



REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 09/00/90	3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE
HUMAN HEALTH EXPOSURE ASSESSMENT FOR ROCKY MOUNTAIN ARSENAL, FINAL, VERSION 4.1

5. FUNDING NUMBERS
DAAA15 88 D 0024

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
EBASCO SERVICES, INC.

8. PERFORMING ORGANIZATION REPORT NUMBER
90277R01

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ROCKY MOUNTAIN ARSENAL (CO.). PMRMA

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

THE OBJECTIVES OF THE HUMAN HEALTH EXPOSURE ASSESSMENT INCLUDE:

1. ESTIMATE THE TYPE AND MAGNITUDE OF EXPOSURES TO CONTAMINANTS
2. IDENTIFY CONTAMINANTS OF CONCERN
3. IDENTIFY SITES FOR REMEDIAL ACTION
4. RECOMMEND SITES FOR THE NO ACTION REMEDIAL ALTERNATIVE
5. PROVIDE A BASIS FOR DETAILED CHARACTERIZATION OF THE RISK ASSOCIATED WITH ALL SITES.

THIS DOCUMENT CONSISTS OF THE FOLLOWING: AN EXCUTIVE SUMMARY. VOL.I - LAND USE AND EXPOSED POPULATION EVALUATIONS. VOL.II & III - TOXICITY ASSESSMENT (INCLUDES ARMY AND SHELL TOXICITY PROFILES). VOL. IV - PPLV METHODOLOGY. VOL. V - PPLV CALCULATIONS. VOL. VI - STUDY AREA EXPOSURE ANALYSIS (A INTRODUCTION, B WESTERN STUDY AREA, C SOUTHERN STUDY AREA, D NORTHERN CENTRAL STUDY AREA, E CENTRAL STUDY AREA, F EASTERN STUDY AREA, G SOUTH PLANTS STUDY AREA, AND H NORTH PLANTS STUDY AREA. VOL. VII - SUMMARY EXPOSURE ASSESSMENT. VOL. VIII -

14. SUBJECT TERMS	15. NUMBER OF PAGES
PPLV, LAND USE, SOIL, WATER, BIOTA	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF ACRONYMS

CAR	Contamination Assessment Report
COC	contaminant of concern
COS	contaminant of significance
CRL	certified reporting limit
CSA	Central Study Area
d	depth to the top of the contamination zone
EI	exposure index
FS	feasibility study
h	depth to the bottom of the contamination zone
ICP	Inductively Coupled Plasma
ISCLT	Industrial Source Complex Long Term Plume Dispersion
MKE	Morrison-Knudsen Engineers
OPHP	organophosphorus compound
PPDDE	2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
PPDDT	2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
PPLV	preliminary pollutant limit value
RI	remedial investigation
RMA	Rocky Mountain Arsenal
RMACCPMT	Rocky Mountain Arsenal Contamination Control Program Management Team
SAR	Study Area Report
SPPPLV	single pathway preliminary pollutant limit value
VEI	vapor exposure index

EXECUTIVE SUMMARY

The Central Study Area (CSA) Exposure Assessment presents detailed exposure analyses for the 10 potentially contaminated areas defined by the Central Study Area Report (SAR). The evaluations were based on the soil and sediment contaminant concentrations presented in the site-specific Contamination Assessment Reports (CARs) and the overall SARs and groundwater contaminants from DP Associates Groundwater Database. The maximum concentrations for each contaminant detected were extracted from these data and reported. Draft preliminary pollutant limit values (PPLVs) were computed for each of these site-specific contaminants as described in Volume IV of the Exposure Assessment Report for the direct (soil ingestion, suspended particulate inhalation, and dermal contact) and indirect (open and enclosed space vapor inhalation) exposure pathways. Cumulative PPLVs were computed for the five exposed populations (regulated visitors, casual visitors, recreational visitors, commercial workers, and industrial workers). The site-by-site evaluations consisted of comparisons of the maximum site contaminant concentrations to their corresponding cumulative Draft PPLVs in order to determine exceedances and, hence, established a first screen for determining sites which may be considered as candidates for remedial action during the Feasibility Study. These are ranked into two categories: Priority 1 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations exceed the draft human health based criteria, and Priority 2 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations do not exceed the draft human health based criteria. Site designations will be reconsidered throughout the Endangerment Assessment process as health based criteria are refined and additional data become available.

No samples from the interior of sewer lines present in the CSA were included in the analysis since these evaluations are based on soil contaminants only. Sewers are being considered for remedial action under the ongoing Feasibility Study.

A groundwater plume has been identified in the CSA. Therefore, in addition to the direct soil exposure evaluations, the significance of the inhalation of volatile groundwater

contaminants which diffuse through site soils was estimated using the open space and enclosed space vapor inhalation models as described in detail in Volume IV (Sections 4.5 and 4.6, respectively) and the exposure analysis procedures presented in Volume VI-A. The exposure evaluations were performed for the most sensitive exposed population (i.e., the industrial worker).

Of the 10 sites evaluated in the CSA, 7 were designated Priority 1 sites based on the most sensitive exposed populations PPLV (i.e., the industrial worker). These include:

- Pesticide Pit (CSA-1a)
- Complex Disposal Area South (CSA-1b)
- Complex Disposal Area North (CSA-1c)
- Sanitary Landfill and Incinerator 834 (CSA-1d)
- Munitions Test Buildings (CSA-2a)
- Parking Lot/Scrap Storage (CSA-2b)
- Section 36 - Low-Level OCP Detection (CSA-4)

Of the 10 sites evaluated in the CSA, 3 were designated Priority 2 sites based on the most sensitive exposed population PPLV (i.e., the industrial worker). These include:

- Munitions Test Site (CSA-2c)
- Incinerator NN3601 (CSA-2d)
- Chemical Sewers - North Plants (CSA-3)

The contaminants of concern (COCs) in soils (i.e., those displaying cumulative exposure indices (EIs) greater than 0.1) for the CSA, based on the most sensitive exposed population PPLV (i.e., the industrial worker), are:

- Aldrin
- Benzene
- Benzothiazole
- Bicycloheptadiene
- Carbon tetrachloride
- Chlordane

- Chloroacetic acid
- Chloroform
- Chlorophenylmethyl sulfide
- Dibromochloropropane
- 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene (PPDDE)
- 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane (PPDDT)
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Dicyclopentadiene
- Dieldrin
- Dimethyldisulfide
- Endrin
- Fluoroacetic acid
- Hexachlorocyclopentadiene
- Isodrin
- Methylene chloride
- Methylisobutyl ketone[1/]
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead

The contaminants of significance (COSs) in groundwater (i.e., those displaying vapor exposure indices (VEIs) greater than 1) for the CSA are:

- Benzene
- Carbon tetrachloride

[1/] Identified as a COC for the commercial worker only (see Volume VII, Section 4.2).

- Chloroform
- Dibromochloropropane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Trichloroethylene

1.0 INTRODUCTION

The analyses and evaluations performed under the Rocky Mountain Arsenal (RMA) Exposure Assessment are documented in eight report volumes. These include Volume I, Surface Use and Exposed Population Evaluations; Volumes II and III, Toxicity Assessment; Volumes IV and V, Preliminary Pollutant Limit Value (PPLV) Methodology; Volume VI, Study Area Exposure Assessments; and Volume VII, Summary Exposure Assessment; and Volume VIII, Response to Comments on the Draft Exposure Assessment.

Volume VI of the Exposure Assessment is a detailed presentation of the study area exposure analyses, consisting of site-by-site comparisons of measured maximum contaminant concentrations to their Draft PPLVs derived for an industrial worker (the most sensitive receptor). Volume VI consists of eight subvolumes, VI-A through VI-H. Subvolume E (this document) constitutes the Study Area Exposure Assessment for the Central Study Area (CSA). The remaining subvolumes are: VI-A, Introduction; VI-B, Western Study Area; VI-C, Southern Study Area; VI-D, North Central Study Area; VI-F, Eastern Study Area; VI-G, South Plants Study Area; and VI-H, North Plants Study Area. A description of the contents, approach, specific procedures, and format in preparing the Study Area Exposure Assessment documents is presented in Volume VI-A.

The exposure assessment for the CSA was performed on a site-by-site basis. The site designations are consistent with those used in the remedial investigation (RI) Study Area Report (SAR) for the CSA (EBASCO, 1989a). The analytical data used for each site were based on the original Rocky Mountain Arsenal Contamination Control Program Management Team (RMACCPMT)/Phase I and II RI site Contamination Assessment Reports (CARs). Additional information on the history of these sites can be found in Section 3.2 of the Central SAR (EBASCO, 1989a). The SARs present a regional overview of the extent of contamination and migration characteristics throughout the Arsenal. An analogous regional overview of the exposure assessment for the CSA is presented in the Study Area Exposure Summary, Section 3.0 of this report volume. This regional summary is integrated with the other study area exposure summaries in Volume VII to provide an Arsenal-wide perspective of the significance of the measured contamination.

The sites included in the CSA Exposure Assessment are as follows:

- Site CSA-1a: Pesticide Pit
- Site CSA-1b: Complex Disposal Area South
- Site CSA-1c: Complex Disposal Area North
- Site CSA-1d: Sanitary Landfill and Incinerator 834
- Site CSA-2a: Munitions Test Buildings
- Site CSA-2b: Parking Lot/Scrap Storage
- Site CSA-2c: Munitions Test Site
- Site CSA-2d: Incinerator NN3601
- Site CSA-3: Chemical Sewers - North Plants
- Site CSA-4: Section 36 - Low-Level OCP Detection

The locations of each of the sites listed above in the CSA were depicted in the Central SAR (EBASCO, 1989a). The site-by-site exposure assessments for each of the 10 areas investigated are presented in Sections 2.1 through 2.10. A study area exposure summary for the CSA is presented in Section 3.0.

The Soil Contaminant Concentration Tables in Sections 2.1 through 2.10, list the maximum concentrations that were calculated for each site over two depth intervals, designated as Horizon 1 and Horizon 2. Horizon 1 included depths from 0 to 10 feet (ft), and Horizon 2 accounted for all depths, including 0 to 10 ft. If the maximum concentration for all depths is in Horizon 1, then the listed concentration in Horizon 2 will equal Horizon 1. For a further discussion, see Volume VI-A, Section 2.2.4. The Inductively Coupled Plasma (ICP) metals (i.e., cadmium, chromium, copper, lead, and zinc), arsenic, and mercury identified as site contaminants in the tables include only those which were detected above indicator levels. The following are the indicator levels used:

Contaminant	Indicator Level
Arsenic	CRL[1/]-10 ug/g[2/]
Cadmium	1-2 ug/g
Chromium	25-40 ug/g
Copper	20-35 ug/g
Lead	25-40 ug/g
Mercury	CRL-0.10 ug/g
Zinc	60-80 ug/g

As described in Volume VI-A of this report, nontarget contaminants were subjected to two screening processes to determine whether or not they should be evaluated in detail in the site-by-site exposure assessments. The first screening was conducted as part of the RMA Chemical Index (EBASCO, 1988a/RIC 88357R01), and was based on the toxicity, concentration, and frequency of occurrence of the nontarget compounds. Contaminants passing through this first screening were then subjected to a second screening that was conducted on a study area-by-study area basis within Appendix A of each Study Area Exposure Assessment (Volumes VI-B through VI-H). This second screening process considered frequency of occurrence, similarity of the nontarget concentration to that of target contaminants, and co-occurrence of nontarget compounds with target compounds in the soil and sediment samples. The reader is encouraged to consult the RMA Chemical Index and the Study Area Exposure Assessment Appendices for details of the screening processes, as it was judged too repetitive to include this information in each site where nontargets were detected.

Draft PPLVs for each of the site contaminants were computed for the five exposed populations of concern which are regulated visitors, casual visitors, recreational visitors, commercial workers, and industrial workers for the direct (i.e., soil ingestion, dermal contact, and suspended particulate inhalation) and indirect (i.e., open and enclosed space vapor inhalation) exposure pathways, according to the methodology detailed in Volume IV of the Exposure Assessment. Draft PPLVs for each site are presented in the Exposure

---

1/ certified reporting limit
2/ micrograms per gram

Evaluation Tables. Figure CSA-1-0 explains various aspects of the data presented in the Exposure Evaluation Tables. For a further discussion of these tables, see Section 3.0 in Volume VI-A.

The cumulative Draft PPLVs in these tables for ICP metals, arsenic, and mercury do not include the single pathway preliminary pollutant limit values (SPPPLVs) computed for vapor inhalation exposure pathways since the potential for inhalation of vaporized ICP metals, arsenic, and mercury is assumed to be negligble (see Volume VI-A). SPPPLVs for the inhalation pathways are not included in the cumulative Draft PPLVs for chloroacetic acid, 1,2-dichloroethylene, dimethylmethyl phosphonate, Dithiane, fluoroacetic acid, isopropylmethyl phosphate, isopropylmethyl phosphonic acid, n-nitrosodimethylamine, 1,4-Oxathiane, Sarin, and thiodiglycol. These chemicals are highly soluble (log Kow less than one) and, therefore, are assumed to have low potential for vaporization. Draft PPLVs were not computed for nontarget chemicals measured at this site since these contaminants were rejected in the nontarget screening (Appendix A).

The chemical-specific and site-specific parameters used to calculate the open and enclosed space vapor inhalation PPLVs are included in the RMA Source Data File, provided as part of the PPLV Computer Model for RMA (Volume V). Contaminant-specific parameters for the open space pathways are the depth to the top of the contamination zone (d), and the depth to the bottom of the contamination zone (h), diffusivity, and soil concentration. These variables are calculated as described in Volume IV. The site-specific parameter, X/F_o, represents the wind dispersion factor at the receptor location receiving the maximum concentration. This parameter was generated by the Industrial Source Complex Long Term (ISCLT) model as described in Volume IV. The distance from the center of the site to the critical receptor location, D_{max}, used with the computation of X/F_o, was calculated as described in Volume IV.

Site-by-site comparisons of the maximum site contaminant concentrations to their corresponding cumulative Draft PPLVs were done in order to determine sites which may be considered for remedial action during the Feasibility Study. These are ranked into two

Figure CSA-1-0
Sample Exposure Summary Table

1	2	3	4	5	6	7	8	9	10
Contaminant	Direct PPLV	Indirect PPLV [1/] OSVI [3/]	ESVI [4/]	Cumulative PPLV	Direct EI [5/]	Indirect EI	Cumulative EI	VEI [2/] OPN [6/]	ENC [7/]
ORGANICS Only contaminants found in either the soil or the groundwater are listed.									
Aldrin	1.16E-01	1.17E+04	4.20E+01	1.16E-01	6.87E+02*	1.91E+00*	6.89E+02*	2.23E-06	1.68E-03
Carbon Tetrachloride	1.52E+01	0.00E+00	0.00E+00	1.52E+01	0.00E+00	0.00E+00	0.00E+00	6.07E-04	4.58E-01
Chlordane	1.52E+00	1.26E+06	5.17E+00	1.17E+00	5.27E+02*	1.55E+02*	6.81E+02*	0.00E+00	0.00E+00
Chloroform	3.11E+02	0.00E+00	0.00E+00	3.11E+02	0.00E+00	0.00E+00	0.00E+00	1.36E-05	1.02E-02
PPDDE	5.72E+00	7.07E+05	1.95E+01	4.42E+00	1.43E-02	4.21E-03	1.85E-02	1.34E-07	1.02E-04
PPDDT	5.72E+00	1.49E+06	1.95E+01	4.42E+00	1.75E+00*	5.14E-01*	2.26E+00*	0.00E+00	0.00E+00
Dieldrin	1.22E-01	5.35E+03	1.92E+01	1.22E-01	2.45E+04*	1.57E+02*	2.47E+04*	0.00E+00	0.00E+00
Diisopropylmethyl Phosphonate	6.77E+04	0.00E+00	0.00E+00	6.77E+04	0.00E+00	0.00E+00	0.00E+00	3.13E-10	2.37E-07
Endrin	2.54E+02	4.33E+06	1.00E+06	2.50E+02	7.88E-02	1.29E-03 a	8.01E-02	0.00E+00	0.00E+00
Hexachlorocyclopentadiene	3.84E+02	5.96E+01	8.34E-01	8.20E-01	7.81E+00*	3.65E+03*	3.66E+03*	0.00E+00	0.00E+00
Isodrin	5.92E+01	8.47E+05	3.04E+03	5.81E+01	8.45E+00*	1.65E-01*	8.61E+00*	0.00E+00	0.00E+00
Supona	1.27E+02	0.00E+00	0.00E+00	1.27E+02	00.E+00	0.00E+00	0.00E+00	1.39E-12	1.05E-09
METALS									
Arsenic	1.61E+00	0.00E+00	0.00E+00	1.61E+00	1.30E+01*	0.00E+00	1.30E+01*	0.00E+00	0.00E+00
Copper	5.71E+02	0.00E+00	0.00E+00	5.71E+04	6.83E-04	0.00E+00	6.83E-04	0.00E+00	0.00E+00
Mercury	4.61E+02	0.00E+00	0.00E+00	4.61E+02	2.38E-03	0.00E+00	2.38E-03	0.00E+00	0.00E+00
Zinc	1.39E+05	0.00E+00	0.00E+00	1.39E+05	7.17E-04	0.00E+00	7.17E-04	0.00E+00	0.00E+00

a This contaminant saturates the soil gas and produces a vapor flux that is below one-tenth of the critical flux. The SPPPLV [8/] for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

A direct PPLV will be computed even if contaminant does not occur in the soil but only in the groundwater.

Indirect PPLVs are not computed for the nonvolatile contaminants (metals).

Contaminants with a Direct EI > 0.1 are denoted with an asterisk.

Contaminants with an Indirect EI > 0.1 are denoted with an asterisk.
A contaminant which saturates the soil gas will not show a VEI.

A contaminant which saturates the soil gas but does not have an Indirect EI exceedance will be denoted with the footnote marker "a." The indirect PPLVs (OSVI, ESVI) are set to 1.00E+06 (pure compound).

Contaminants which occur in the groundwater, but also occur in the soil may not have a computed VEI if the contamination saturates the soil gas.

VEIs are not computed for metals or organics if the contaminant does not occur in the groundwater.

An enclosed space VEI may not be computed if the reported depth to groundwater is less than 10 ft. In such cases, the enclosed space VEI will have "NA" for not applicable. No enclosed space VEI will be computed for lake sites. For lake sites, the enclosed space VEI will have "LS" for lake site.

1/ PPLV - preliminary pollutant limit value
2/ VEI - vapor exposure index
3/ OSVI - open space vapor inhalation PPLLV
4/ ESVI - enclosed space vapor inhalation PPLV
5/ EI - exposure index
6/ OPN - open
7/ ENC - enclosed
8/ SPPPLV - single pathway preliminary pollutant limit value

categories: Priority 1 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations exceed the draft human health based criteria, and Priority 2 which consists of sites where available soil contaminant concentration data indicate that the maximum detected concentrations do not exceed the draft human health based criteria. Site designations will be reconsidered throughout the Endangerment Assessment process as health based criteria are refined and additional data become available.

2.0 SITE-BY-SITE EXPOSURE ASSESSMENT

2.1 SITE CSA-1a: PESTICIDE PIT (formerly Site 36-3: Insecticide Pit; ESE, 1987/RIC 87203R01 and ESE, 1988a/RIC 87203R01A)

2.1.1 Site-Specific Considerations

Figure CSA-1a-1 and Tables CSA-1a-1 and CSA-1a-2 depict the target contaminants for Site CSA-1a. Borings 3173 through 3180, 3430 through 3454, and 3456 through 3458 were included in this exposure assessment, consistent with the Central SAR. The history search conducted under the contaminant assessment revealed that herbicide-related organophosphorus compounds (OPHPs), such as parathion and vapona, were suspected contaminants in Site CSA-1a (ESE, 1987/RIC 87203R01). According to site history, no other chemicals from the RMA target contaminant list were suspected to be present in Site CSA-1a (ESE, 1988a/RIC 87203R01A).

2.1.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-1a are depicted in Figure CSA-1a-1. The following contaminants were not included in the figure, since they were not considered target contaminants during the Phase I and Phase II investigations: Hexachlorobenzene, occurring in Borings 3173 (0-1 ft), 3174 (0-1 ft) and 3445 (4-5 ft); hexachlorobutadiene, occurring in Borings 3445 (5-6, 6-7, and 9-10 ft), 3457 (8-9 and 9-10 ft) and 3458 (7-8 ft); 4-hydroxy-4-methyl-2-pentanone, occurring in Boring 3179 (3-4 ft); methyl cyclohexane, occurring in Borings 3445 (9-10 ft) and 3457 (8-9 and 9-10 ft); methylphosphonic acid, occurring in Boring 3443 (7-8 ft); pentachlorobenzene, occurring in Borings 3445 (5-6, 6-7, and 9-10 ft) and 3457 (9-10 ft), tetrachlorobenzene, occurring in Borings 3445 (5-6 ft) and 3457 (9-10 ft); and trichloropropene, occurring in Boring 3174 (0-1 ft). Although not shown in this figure, these nontarget compounds were included in the Central SAR and in this exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988a/RIC 88357R01).

Table CSA-1a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and certified reporting

limits (CRLs) for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-1a-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.1.3 Site Exposure Summary

Tables CSA-1a-3 through CSA-1a-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-1a is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Dibromochloropropane	Dir/Ind	Dir/Ind	Dir/Ind	Dir/Ind	Dir/Ind
Dieldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Endrin	Direct	Direct	Direct	Direct	Direct
Fluoroacetic acid	Direct	Direct	Direct	Direct	Direct
Hexachloro-cyclopentadiene	Direct	Direct	Dir/Ind	Dir/Ind	Dir/Ind
Isodrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Tetrachloroethylene	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Benzene	--	--	Direct	Indirect	Dir/Ind
Carbon tetrachloride	--	--	Direct	Indirect	Dir/Ind
Chlordane	--	--	Direct	--	Direct
PPDDE	--	--	Direct	Cumulative	Direct
Benzothiazole	--	--	--	Indirect	Indirect
Bicycloheptadiene	--	--	--	Indirect	--
Chloroform	--	--	--	Indirect	Indirect
Chlorophenylmethyl sulfide	--	--	--	Indirect	--
1,2-Dichloroethane	--	--	--	Indirect	Indirect
1,1-Dichloroethylene	--	--	--	Indirect	Indirect
Dicyclopentadiene	--	--	--	Indirect	Dir/Ind

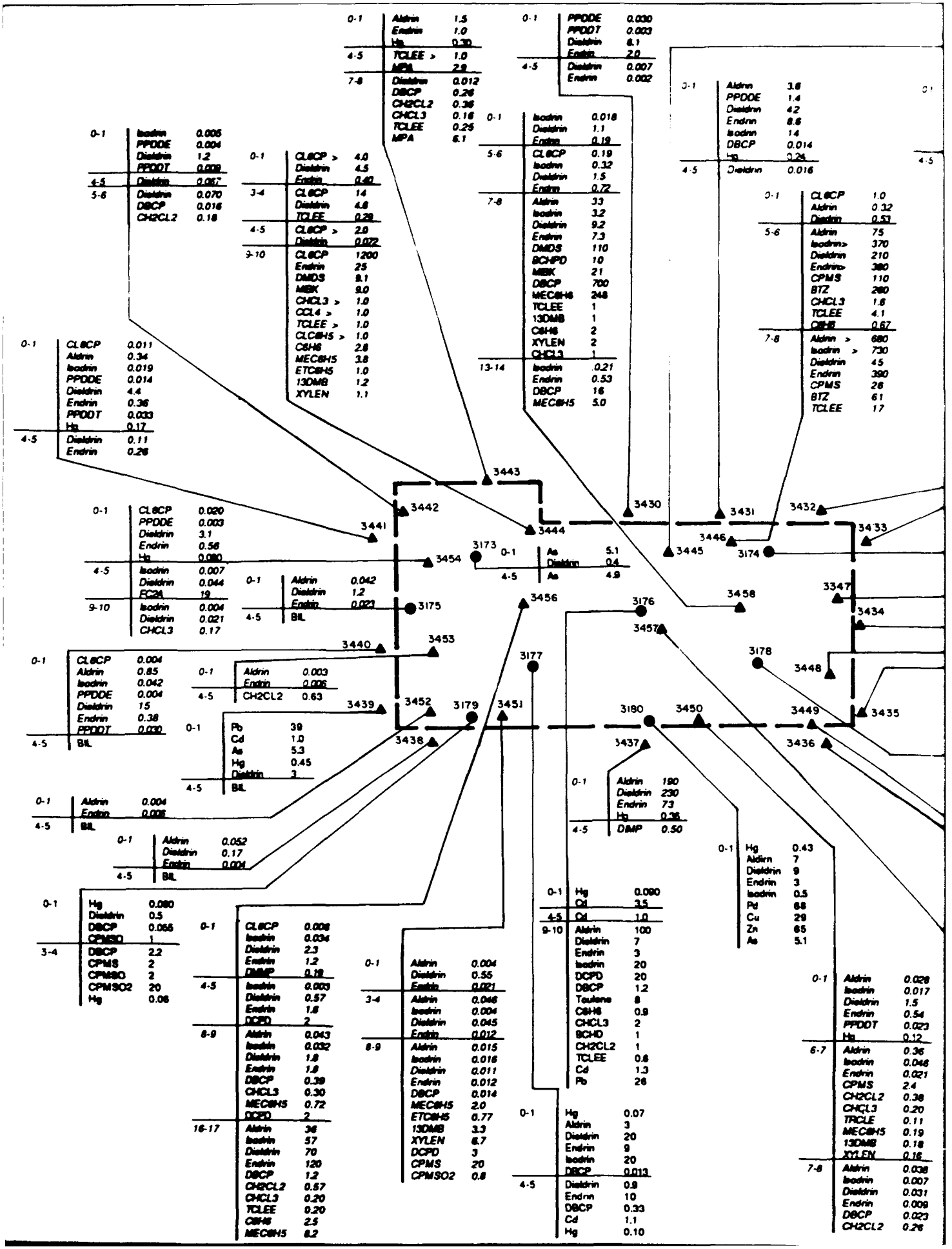
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Dimethyldisulfide	--	--	--	Indirect	Indirect
Methylisobutyl ketone	--	--	--	Indirect	--
Methylene chloride	--	--	--	Indirect	Indirect
Cadmium	--	--	--	--	Direct

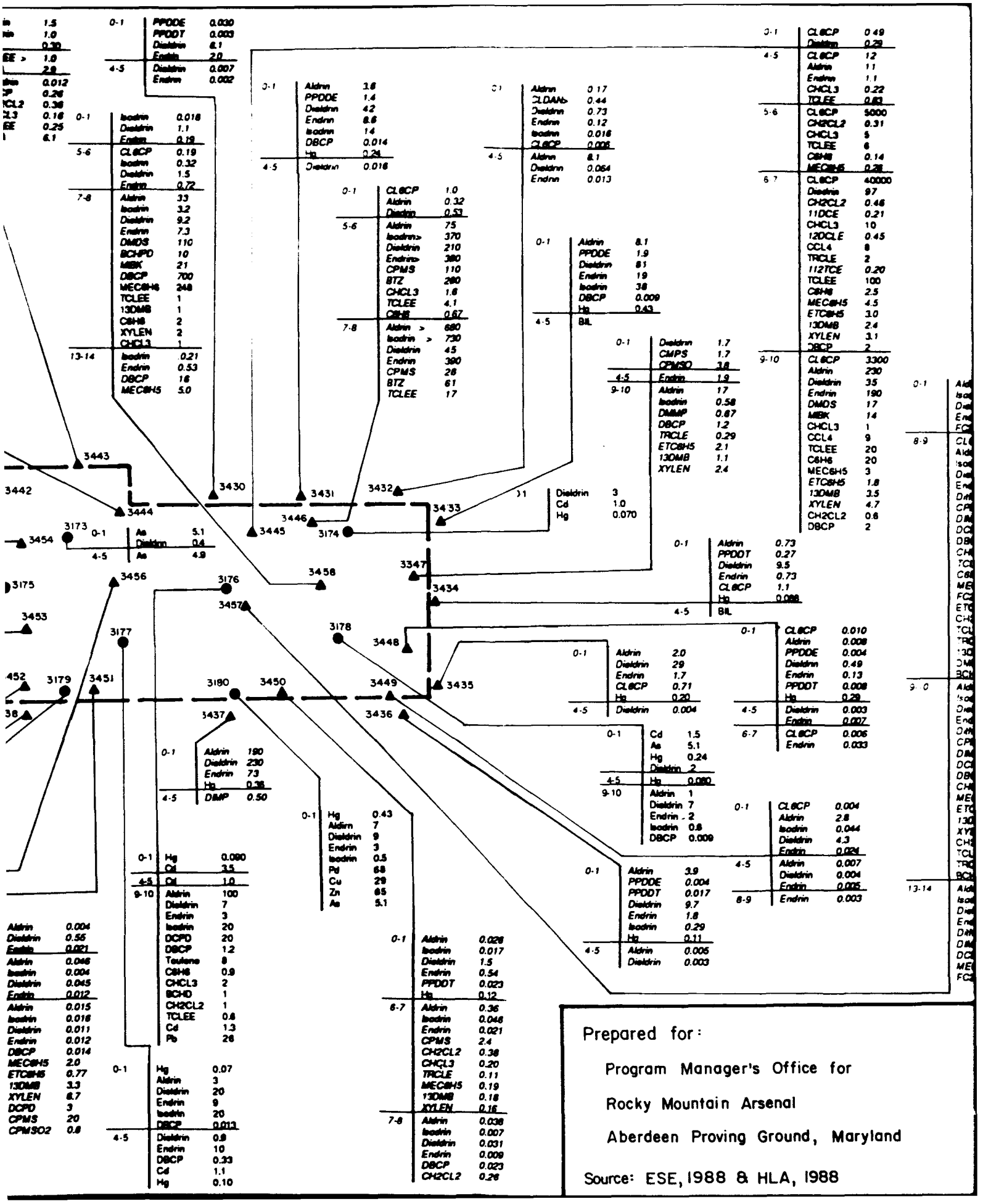
Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

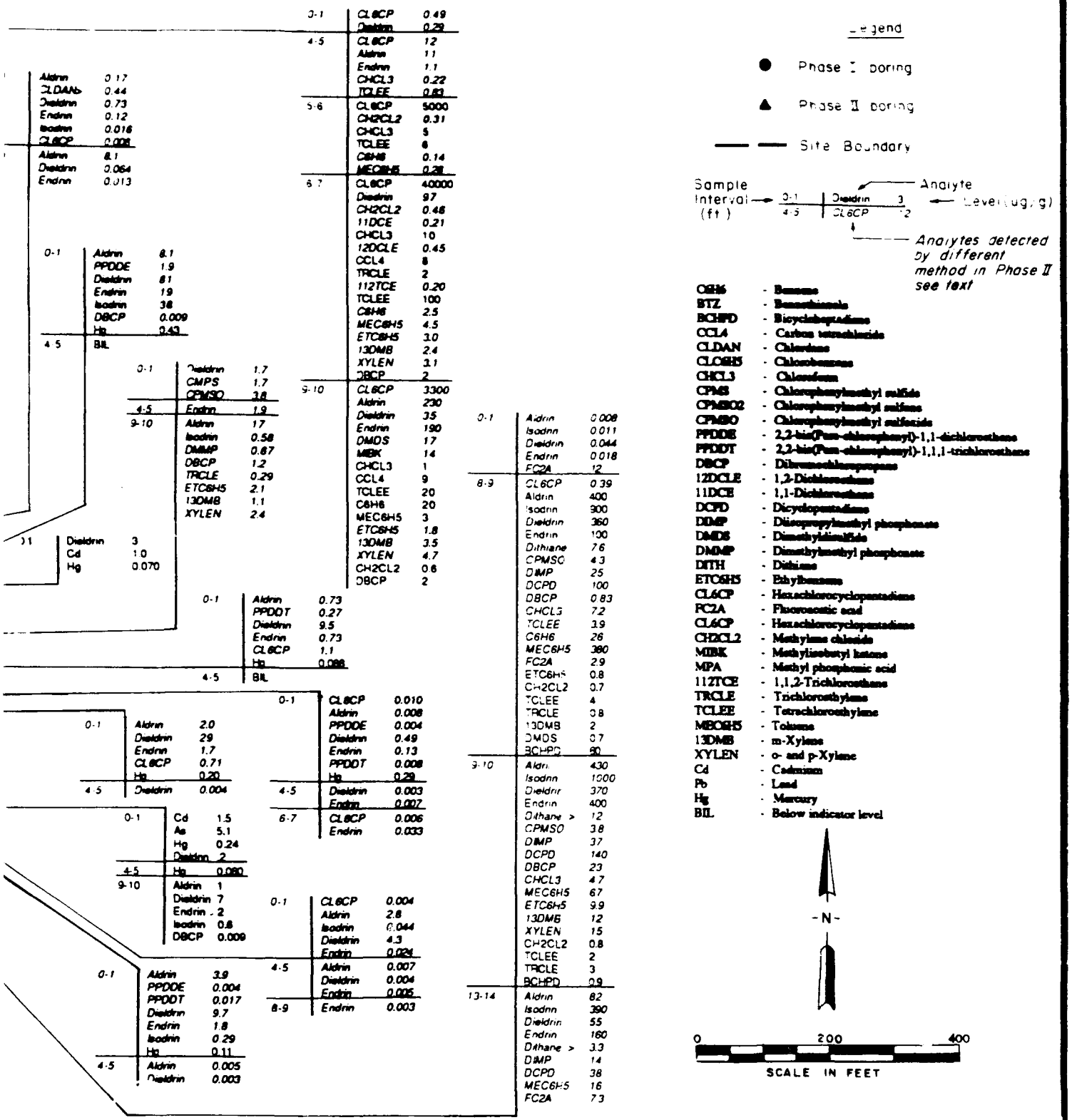
The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. It should be noted for PPDDE, the cumulative EI exceeds 0.1 for the commercial worker but the direct and indirect EIs do not exceed 0.1. Site CSA-1a is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

The following groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by a VEI value greater than 1:

- Benzene (enclosed)
- Carbon tetrachloride (enclosed)
- Chloroform (enclosed)
- Dibromochloropropane (enclosed)
- Trichloroethylene (enclosed)


0-1 Aldrin 1.5 Endrin 1.0 Hg 0.30
4-5 TCLEE > 1.0 MPA 2.9
7-8 Dieldrin 0.012 DBCP 0.26 CH2CL2 0.36 CHCL3 0.16 TCLEE 0.25 MPA 6.1
0-1 PPDDE 0.030 PPDDT 0.003 Dieldrin 6.1 Endrin 2.0
4-5 Dieldrin 0.007 Endrin 0.002
0-1 Isodrin 0.018 Dieldrin 1.1 Endrin 0.19
5-6 CL6CP 0.19 Isodrin 0.32 Dieldrin 1.5 Endrin 0.72
7-8 Aldrin 33 Isodrin 3.2 Dieldrin 9.2 Endrin 7.3 DMDS 110 BCHPD 10 MIBK 21 DBCP 700 MEC6H6 248 TCLEE 1 13DMB 1 C6H6 2 XYLEN 2 CHCL3 1
13-14 Isodrin .021 Endrin 0.53 DBCP 16 MEC6H5 5.0
0-1 Aldrin 3.6 PPDDE 1.4 Dieldrin 42 Endrin 8.6 Isodrin 14 DBCP 0.014 Hg 0.24
4-5 Dieldrin 0.016
0-1 CL6CP 1.0 Aldrin 0.32 Dieldrin 0.53
5-6 Aldrin 75 Isodrin> 370 Dieldrin 210 Endrin> 380 CPMS 110 BTZ 280 CHCL3 1.8 TCLEE 4.1 C6H6 0.67
7-8 Aldrin > 680 Isodrin > 730 Dieldrin 45 Endrin 390 CPMS 28 BTZ 61 TCLEE 17
0-1 Isodrin 0.005 PPDDE 0.004 Dieldrin 1.2 PPDDT 0.008
4-5 Dieldrin 0.067
5-6 Dieldrin 0.070 DBCP 0.016 CH2CL2 0.18
0-1 CL6CP > 4.0 Dieldrin 4.5 Endrin 0.40
3-4 CL6CP 14 Dieldrin 4.8 TCLEE 0.29
4-5 CL6CP > 2.0 Dieldrin 0.072
9-10 CL6CP 1200 Endrin 25 DMDS 9.1 MIBK 9.0 CHCL3 > 1.0 CCL4 > 1.0 TCLEE > 1.0 CLC6H5 > 1.0 C6H6 2.8 MEC6H5 3.8 ETC6H5 1.0 13DMB 1.2 XYLEN 1.1
0-1 CL6CP 0.011 Aldrin 0.34 Isodrin 0.019 PPDDE 0.014 Dieldrin 4.4 Endrin 0.36 PPDDT 0.003 Hg 0.17
4-5 Dieldrin 0.11 Endrin 0.26
0-1 CL6CP 0.020 PPDDE 0.003 Dieldrin 3.1 Endrin 0.56 Hg 0.080
4-5 Isodrin 0.007 Dieldrin 0.044 FC2A 19
9-10 Isodrin 0.004 Dieldrin 0.021 CHCL3 0.17
0-1 Aldrin 0.042 Dieldrin 1.2 Endrin 0.023
4-5 BIL
0-1 CL6CP 0.004 Aldrin 0.85 Isodrin 0.042 PPDDE 0.004 Dieldrin 15 Endrin 0.38 PPDDT 0.030
4-5 BIL
0-1 Aldrin 0.003 Endrin 0.006
4-5 CH2CL2 0.63
0-1 Pb 39 Cd 1.0 As 5.3 Hg 0.45 Dieldrin 3
4-5 BIL
0-1 Aldrin 0.004 Endrin 0.008
4-5 BIL
0-1 Aldrin 0.052 Dieldrin 0.17 Endrin 0.004
4-5 BIL
0-1 Hg 0.080 Dieldrin 0.5 DBCP 0.056 CPMSO 1
3-4 DBCP 2.2 CPMS 2 CPMSO 2 CPMSO2 20 Hg 0.06
0-1 CL6CP 0.008 Isodrin 0.034 Dieldrin 2.3 Endrin 1.2 DMMP 0.19
4-5 Isodrin 0.003 Dieldrin 0.57 Endrin 1.8 DCPD 2
8-9 Aldrin 0.043 Isodrin 0.032 Dieldrin 1.8 Endrin 1.8 DBCP 0.39 CHCL3 0.30 MEC6H5 0.72 DCPD 2
16-17 Aldrin 36 Isodrin 57 Dieldrin 70 Endrin 120 DBCP 1.2 CH2CL2 0.57 CHCL3 0.20 TCLEE 0.20 C6H6 2.5 MEC6H5 8.2
0-1 Aldrin 0.004 Dieldrin 0.55 Endrin 0.021
3-4 Aldrin 0.046 Isodrin 0.004 Dieldrin 0.045 Endrin 0.012
8-9 Aldrin 0.015 Isodrin 0.016 Dieldrin 0.011 Endrin 0.012 DBCP 0.014 MEC6H5 2.0 ETC6H5 0.77 13DMB 3.3 XYLEN 6.7 DCPD 3 CPMS 20 CPMSO2 0.8
0-1 Hg 0.090 Cd 3.5
4-5 Cd 1.0
9-10 Aldrin 100 Dieldrin 7 Endrin 3 Isodrin 20 DCPD 20 DBCP 1.2 Toulene 8 C6H6 0.9 CHCL3 2 BCHD 1 CH2CL2 1 TCLEE 0.6 Cd 1.3 Pb 26
0-1 Hg 0.07 Aldrin 3 Dieldrin 20 Endrin 9 Isodrin 20 DBCP 0.013
4-5 Dieldrin 0.9 Endrin 10 DBCP 0.33 Cd 1.1 Hg 0.10
0-1 Aldrin 190 Dieldrin 230 Endrin 73 Hg 0.36
4-5 DMP 0.50
0-1 Hg 0.43 Aldrin 7 Dieldrin 9 Endrin 3 Isodrin 0.5 Pd 68 Cu 29 Zn 65 As 5.1
0-1 Aldrin 0.028 Isodrin 0.017 Dieldrin 1.5 Endrin 0.54 PPDDT 0.023 Hg 0.12
6-7 Aldrin 0.36 Isodrin 0.046 Endrin 0.021 CPMS 2.4 CH2CL2 0.38 CHCL3 0.20 TRCLE 0.11 MEC6H5 0.19 13DMB 0.18 XYLEN 0.16
7-8 Aldrin 0.038 Isodrin 0.007 Dieldrin 0.031 Endrin 0.009 DBCP 0.023 CH2CL2 0.26
3173 0-1 As 5.1 Dieldrin 0.4
4-5 As 4.9
3441 3442 3443 3444 3430 3431 3432 3433 3434 3435 3436 3437 3438 3439 3440 3445 3446 3447 3448 3449 3450 3451 3452 3453 3454 3456 3457 3458 3174 3175 3176 3177 3178 3179 3180


3443
3442
3444
3430
3431
3432
3433
3446
3445
3174
3434
3347
3454
3173
3456
3458
3176
3457
3175
3453
3177
3178
3448
3452
3179
3451
3180
3450
3449
3435
3436
3437
Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland
Source: ESE, 1988 & HLA, 1988



Prepared for:

Program Manager's Office for

Rocky Mountain Arsenal

Aberdeen Proving Ground, Maryland

Source: ESE, 1988 & HLA, 1988

FIGURE CSA-1a-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE CSA-1a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1a

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	>680	7-8	3446	>680	7-8	3446
Benzene	26	8-9	3457	26	8-9	3457
Benzothiazole	260	5-6	3446	260	5-6	3446
Bicycloheptadiene	60	8-9	3457	60	8-9	3457
Carbon tetrachloride	9	9-10	3445	9	9-10	3445
Chlordane	>0.44	0-1	3432	>0.44	0-1	3432
Chlorobenzene	>1.0	9-10	3444	>1.0	9-10	3444
Chloroform	10	6-7	3445	10	6-7	3445
Chlorophenylmethyl sulfide	110	5-6	3446	110	5-6	3446
Chlorophenylmethyl sulfone	20	3-4	3179	20	3-4	3179
Chlorophenylmethyl sulfoxide	4.3	8-9	3457	4.3	8-9	3457
PPDDE[1/]	1.9	0-1	3433	1.9	0-1	3433
PPDDT[2/]	0.27	0-1	3434	0.27	0-1	3434
Dibromochloropropane	700	7-8	3458	700	7-8	3458
1,2-Dichloroethane	0.45	6-7	3445	0.45	6-7	3445
1,1-Dichloroethene	0.21	6-7	3445	0.21	6-7	3445
Dicyclopentadiene	140	9-10	3457	140	9-10	3457
Dieldrin	370	9-10	3457	370	9-10	3457
Diisopropylmethyl phosphonate	37	9-10	3457	37	9-10	3457
Dimethyldisulfide	110	7-8	3458	110	7-8	3458
Dimethylmethyl phosphonate	0.67	9-10	3447	0.67	9-10	3447
Dithiane	>12	9-10	3457	>12	9-10	3457
Endrin	400	9-10	3457	400	9-10	3457
Ethylbenzene	9.9	9-10	3457	9.9	9-10	3457

TABLE CSA-1a-1 (Continued)
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1a

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Fluoroacetic acid	19	4-5	3454	19	4-5	3454
Hexachlorobenzene[3/]	20	4-5	3445	20	4-5	3445
Hexachlorobutadiene[3/]	600	6-7	3445	600	6-7	3445
Hexachlorocyclopentadiene	40000	6-7	3445	40000	6-7	3445
4-Hydroxy-4-methyl-2-Pentanone[3/]	0.8	3-4	3179	0.8	3-4	3179
Isodrin	1000	9-10	3457	1000	9-10	3457
Methyl cyclohexane[3/]	100	8-9	3457	100	8-9	3457
Methylene chloride	1	9-10	3176	1	9-10	3176
Methylisobutyl ketone	21	7-8	3458	21	7-8	3458
Methylphosphonic acid[3/]	6.1	7-8	3443	6.1	7-8	3443
Pentachlorobenzene[3/]	900	5-6	3445	900	5-6	3445
Tetrachlorobenzene[3/]	20	5-6	3445	20	5-6	3445
Tetrachloroethylene	100	6-7	3445	100	6-7	3445
Toluene	380	8-9	3457	380	8-9	3457
1,1,2-Trichloroethane	0.20	6-7	3445	0.20	6-7	3445
Trichloroethylene	3	9-10	3457	3	9-10	3457
Trichloropropene[3/]	1.0	0-1	3174	1.0	0-1	3174
m-Xylene	12	9-10	3457	12	9-10	3457
o,p-Xylene	15	9-10	3457	15	9-10	3457
Cadmium	3.5	0-1	3176	--	--	--
Lead	68	0-1	3180	--	--	--
Mercury	0.45	0-1	3439	--	--	--

TABLE CSA-1a-1 (Continued)
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1a

1/ PPDDE 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
2/ PPDDT 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
3/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-1a-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1a

AVERAGE SITE DEPTH TO GROUNDWATER: 14 Feet

CHEMICAL	CONCENTRATION MAXIMUM		LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE		250	36592	02/16/88
CARBON TETRACHLORIDE		2000	36592	02/16/88
CHLOROFORM		1000	36592	02/16/88
CHLOROBENZENE	GT	1000	36592	02/16/88
CHLOROPHENYLMETHYL SULFIDE		40	36592	02/16/88
CHLOROPHENYLMETHYL SULFOXIDE		32	36592	02/16/88
CHLOROPHENYLMETHYL SULFONE		7.6	36592	02/16/88
DIBROMOCHLOROPROPANE		21	36592	02/16/88
DIISOPROPYLMETHYL PHOSPHONATE		33	36592	02/16/88
DIMETHYLMETHYL PHOSPHONATE		1.1	36065	01/4/89
TOLUENE		5.4	36065	01/4/89
TETRACHLOROETHYLENE		26	36592	02/16/88
TRICHLOROETHYLENE		440	36592	02/16/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-1a-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.0E+06	1.5E+00	4.5E+02*	6.0E-05a	4.5E+02*	0.0E+00
BENZENE	8.6E+02	2.7E+05	8.6E+02	3.0E-02	9.7E-05	3.0E-02	8.0E-06
BENZOTHIAZOLE	3.9E+04	1.0E+06	3.9E+04	6.7E-03	8.5E-06a	6.7E-03	0.0E+00
BICYCLOHEPTADIENE	3.2E+05	4.3E+08	3.2E+05	1.9E-04	1.4E-07	1.9E-04	0.0E+00
CARBON TETRACHLORIDE	2.0E+02	8.8E+04	1.9E+02	4.6E-02	1.0E-04	4.6E-02	1.1E-03
CHLORDANE	2.0E+01	1.2E+09	2.0E+01	2.3E-02	3.6E-10	2.3E-02	0.0E+00
CHLOROBENZENE	1.6E+05	4.4E+07	1.6E+05	6.2E-06	2.3E-08	6.2E-06	2.8E-07
CHLOROFORM	4.0E+03	8.1E+05	4.0E+03	2.5E-03	1.2E-05	2.5E-03	4.8E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	1.0E+06	1.6E+05	6.7E-04	1.6E-07a	6.7E-04	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.6E+05	3.1E+08	1.6E+05	1.2E-04	6.4E-08	1.2E-04	1.0E-12
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	1.1E+08	1.6E+05	2.6E-05	3.8E-08	2.6E-05	8.2E-12
PPDDE	7.4E+01	6.9E+08	7.4E+01	2.6E-02	2.8E-09	2.6E-02	0.0E+00
PPDDT	7.4E+01	1.5E+09	7.4E+01	3.7E-03	1.9E-10	3.7E-03	0.0E+00
DIBROMOCHLOROPROPANE	1.8E+01	4.8E+03	1.8E+01	3.9E+01*	1.5E-01*	3.9E+01*	1.4E-06
1,2-DICHLOROETHANE	2.8E+02	2.9E+05	2.8E+02	1.6E-03	1.6E-06	1.6E-03	0.0E+00
1,1-DICHLOROETHYLENE	4.3E+01	2.2E+04	4.3E+01	4.9E-03	9.7E-06	4.9E-03	0.0E+00
DICYCLOPENTADIENE	5.4E+04	1.0E+06	4.7E+04	2.6E-03	3.9E-04a	3.0E-03	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	2.4E+02*	7.1E-05a	2.4E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	3.2E+08	6.6E+05	5.6E-05	1.1E-07	5.6E-05	2.4E-11
DIMETHYLDISULFIDE	6.7E+04	4.9E+07	6.7E+04	1.6E-03	2.3E-06	1.6E-03	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	4.5E-06	0.0E+00	4.5E-06	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	1.5E-04	0.0E+00	1.5E-04	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	1.6E-01*	9.5E-08a	1.6E-01*	0.0E+00
ETHYLBENZENE	8.3E+05	4.3E+08	8.2E+05	1.2E-05	2.3E-08	1.2E-05	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	4.9E-01*	0.0E+00	4.9E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	1.0E+06	1.7E+04	2.4E+00*	9.1E-03a	2.4E+00*	0.0E+00
ISODRIN	5.8E+02	1.0E+06	5.8E+02	1.7E+00*	1.2E-06a	1.7E+00*	0.0E+00
METHYLISOBUTYL KETONE	4.1E+05	1.3E+08	4.1E+05	5.1E-05	1.6E-07	5.2E-05	0.0E+00
METHYLENE CHLORIDE	3.3E+03	5.6E+05	3.3E+03	3.1E-04	1.8E-06	3.1E-04	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.2E+06	5.1E+02	2.0E-01*	8.1E-05	2.0E-01*	3.7E-07
TOLUENE	2.5E+06	3.4E+09	2.5E+06	1.5E-04	1.1E-07	1.5E-04	2.6E-11
1,1,2-TRICHLOROETHANE	4.3E+02	4.4E+05	4.3E+02	4.6E-04	4.5E-07	4.6E-04	0.0E+00
TRICHLOROETHYLENE	2.3E+03	5.1E+05	2.3E+03	1.3E-03	5.8E-06	1.3E-03	1.2E-05
M-XYLENE	1.4E+07	3.7E+08	1.4E+07	8.4E-07	3.2E-08	8.7E-07	0.0E+00
O,P-XYLENE	1.4E+07	3.7E+08	1.4E+07	1.1E-06	4.0E-08	1.1E-06	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.8E-03	0.0E+00	7.8E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.4E-03	0.0E+00	4.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.4E-04	0.0E+00	1.4E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1a-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.0E+06	1.5E+00	4.5E+02*	6.0E-05a	4.5E+02*	0.0E+00
BENZENE	8.6E+02	2.7E+05	8.6E+02	3.0E-02	9.7E-05	3.0E-02	8.0E-06
BENZOTHIAZOLE	3.9E+04	1.0E+06	3.9E+04	6.7E-03	8.5E-06a	6.7E-03	0.0E+00
BICYCLOHEPTADIENE	3.2E+05	4.3E+08	3.2E+05	1.9E-04	1.4E-07	1.9E-04	0.0E+00
CARBON TETRACHLORIDE	2.0E+02	8.8E+04	1.9E+02	4.6E-02	1.0E-04	4.6E-02	1.1E-03
CHLORDANE	2.0E+01	1.2E+09	2.0E+01	2.3E-02	3.6E-10	2.3E-02	0.0E+00
CHLOROBENZENE	1.6E+05	4.4E+07	1.6E+05	6.2E-06	2.3E-08	6.2E-06	2.8E-07
CHLOROFORM	4.0E+03	8.1E+05	4.0E+03	2.5E-03	1.2E-05	2.5E-03	4.8E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	1.0E+06	1.6E+05	6.7E-04	1.6E-07a	6.7E-04	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.6E+05	3.1E+08	1.6E+05	1.2E-04	6.4E-08	1.2E-04	1.0E-12
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	1.1E+08	1.6E+05	2.6E-05	3.8E-08	2.6E-05	8.2E-12
PPDDE	7.4E+01	6.9E+08	7.4E+01	2.6E-02	2.8E-09	2.6E-02	0.0E+00
PPDDT	7.4E+01	1.5E+09	7.4E+01	3.7E-03	1.9E-10	3.7E-03	0.0E+00
DIBROMOCHLOROPROPANE	1.8E+01	4.8E+03	1.8E+01	3.9E+01*	1.5E-01*	3.9E+01*	1.4E-06
1,2-DICHLOROETHANE	2.8E+02	2.9E+05	2.8E+02	1.6E-03	1.6E-06	1.6E-03	0.0E+00
1,1-DICHLOROETHYLENE	4.3E+01	2.2E+04	4.3E+01	4.9E-03	9.7E-06	4.9E-03	0.0E+00
DICYCLOPENTADIENE	5.4E+04	1.0E+06	4.7E+04	2.6E-03	3.9E-04a	3.0E-03	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	2.4E+02*	7.1E-05a	2.4E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	3.2E+08	6.6E+05	5.6E-05	1.1E-07	5.6E-05	2.4E-11
DIMETHYLDISULFIDE	6.7E+04	4.9E+07	6.7E+04	1.6E-03	2.3E-06	1.6E-03	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	4.5E-06	0.0E+00	4.5E-06	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	1.5E-04	0.0E+00	1.5E-04	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	1.6E-01*	9.5E-08a	1.6E-01*	0.0E+00
ETHYLBENZENE	8.3E+05	4.3E+08	8.2E+05	1.2E-05	2.3E-08	1.2E-05	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	4.9E-01*	0.0E+00	4.9E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	1.0E+06	1.7E+04	2.4E+00*	9.1E-03a	2.4E+00*	0.0E+00
ISODRIN	5.8E+02	1.0E+06	5.8E+02	1.7E+00*	1.2E-06a	1.7E+00*	0.0E+00
METHYLISOBUTYL KETONE	4.1E+05	1.3E+08	4.1E+05	5.1E-05	1.6E-07	5.2E-05	0.0E+00
METHYLENE CHLORIDE	3.3E+03	5.6E+05	3.3E+03	3.1E-04	1.8E-06	3.1E-04	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.2E+06	5.1E+02	2.0E-01*	8.1E-05	2.0E-01*	3.7E-07
TOLUENE	2.5E+06	3.4E+09	2.5E+06	1.5E-04	1.1E-07	1.5E-04	2.6E-11
1,1,2-TRICHLOROETHANE	4.3E+02	4.4E+05	4.3E+02	4.6E-04	4.5E-07	4.6E-04	0.0E+00
TRICHLOROETHYLENE	2.3E+03	5.1E+05	2.3E+03	1.3E-03	5.8E-06	1.3E-03	1.2E-05
M-XYLENE	1.4E+07	3.7E+08	1.4E+07	8.4E-07	3.2E-08	8.7E-07	0.0E+00
O,P-XYLENE	1.4E+07	3.7E+08	1.4E+07	1.1E-06	4.0E-08	1.1E-06	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.8E-03	0.0E+00	7.8E-03	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.4E-03	0.0E+00	4.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.4E-04	0.0E+00	1.4E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1a-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	1.0E+06	2.1E-01	3.3E+03*	9.0E-04a	3.3E+03*	0.0E+00
BENZENE	1.2E+02	4.2E+04	1.2E+02	2.2E-01*	6.2E-04	2.2E-01*	1.2E-04
BENZOTHIAZOLE	1.7E+04	1.0E+06	1.7E+04	1.6E-02	2.4E-05a	1.6E-02	0.0E+00
BICYCLOHEPTADIENE	1.4E+05	1.6E+08	1.4E+05	4.4E-04	3.9E-07	4.4E-04	0.0E+00
CARBON TETRACHLORIDE	2.7E+01	1.4E+04	2.7E+01	3.3E-01*	6.6E-04	3.3E-01*	1.7E-02
CHLORDANE	2.7E+00	8.2E+07	2.7E+00	1.6E-01*	5.4E-09	1.6E-01*	0.0E+00
CHLOROBENZENE	6.8E+04	1.6E+07	6.8E+04	1.5E-05	6.3E-08	1.5E-05	1.8E-06
CHLOROFORM	5.6E+02	1.3E+05	5.6E+02	1.8E-02	7.9E-05	1.8E-02	7.2E-05
CHLOROPHENYLMETHYL SULFIDE	7.0E+04	1.0E+06	6.9E+04	1.6E-03	4.7E-06a	1.6E-03	0.0E+00
CHLOROPHENYLMETHYL SULFONE	7.0E+04	9.5E+07	7.0E+04	2.9E-04	2.1E-07	2.9E-04	6.5E-12
CHLOROPHENYLMETHYL SULFOXIDE	7.0E+04	1.7E+07	6.9E+04	6.2E-05	2.5E-07	6.2E-05	5.3E-11
PPDDE	1.0E+01	4.6E+07	1.0E+01	1.9E-01*	4.2E-08	1.9E-01*	0.0E+00
PPDDT	1.0E+01	9.6E+07	1.0E+01	2.6E-02	2.8E-09	2.6E-02	0.0E+00
DIBROMOCHLOROPROPANE	2.5E+00	7.4E+02	2.5E+00	2.8E+02*	9.4E-01*	2.8E+02*	2.1E-05
1,2-DICHLOROETHANE	3.9E+01	4.4E+04	3.9E+01	1.2E-02	1.0E-05	1.2E-02	0.0E+00
1,1-DICHLOROETHYLENE	5.9E+00	3.3E+03	5.9E+00	3.5E-02	6.3E-05	3.6E-02	0.0E+00
DICYCLOPENTADIENE	1.8E+04	1.0E+06	1.6E+04	7.7E-03	1.1E-03a	8.7E-03	0.0E+00
DIELDRIN	2.2E-01	1.0E+06	2.2E-01	1.7E+03*	1.1E-03a	1.7E+03*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	1.2E+08	2.8E+05	1.3E-04	3.2E-07	1.3E-04	1.6E-10
DIMETHYLDISULFIDE	2.9E+04	1.8E+07	2.8E+04	3.9E-03	6.3E-06	3.9E-03	0.0E+00
DIMETHYMETHYL PHOSPHONATE	6.3E+04	0.0E+00	6.3E+04	1.1E-05	0.0E+00	1.1E-05	0.0E+00
DITHIANE	3.5E+04	0.0E+00	3.5E+04	3.4E-04	0.0E+00	3.4E-04	0.0E+00
ENDRIN	1.1E+03	1.0E+06	1.1E+03	3.8E-01*	6.1E-07a	3.8E-01*	0.0E+00
ETHYLBENZENE	3.5E+05	1.6E+08	3.5E+05	2.8E-05	6.3E-08	2.8E-05	0.0E+00
FLUOROACETIC ACID	1.7E+01	0.0E+00	1.7E+01	1.1E+00*	0.0E+00	1.1E+00*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	1.5E+04	4.1E+03	7.1E+00*	2.6E+00*	9.7E+00*	0.0E+00
ISODRIN	2.5E+02	1.0E+06	2.5E+02	4.1E+00*	7.8E-06a	4.1E+00*	0.0E+00
METHYLISOBUTYL KETONE	1.7E+05	4.7E+07	1.7E+05	1.2E-04	4.5E-07	1.2E-04	0.0E+00
METHYLENE CHLORIDE	4.5E+02	8.7E+04	4.5E+02	2.2E-03	1.1E-05	2.2E-03	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	1.9E+05	7.1E+01	1.4E+00*	5.2E-04	1.4E+00*	5.6E-06
TOLUENE	1.1E+06	1.2E+09	1.1E+06	3.6E-04	3.1E-07	3.6E-04	1.7E-10
1,1,2-TRICHLOROETHANE	6.0E+01	6.8E+04	6.0E+01	3.3E-03	2.9E-06	3.3E-03	0.0E+00
TRICHLOROETHYLENE	3.2E+02	8.0E+04	3.2E+02	9.4E-03	3.8E-05	9.5E-03	1.9E-04
M-XYLENE	5.8E+06	1.3E+08	5.6E+06	2.1E-06	8.9E-08	2.2E-06	0.0E+00
O,P-XYLENE	5.8E+06	1.3E+08	5.6E+06	2.6E-06	1.1E-07	2.7E-06	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	6.1E-02	0.0E+00	6.1E-02	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	7.4E-03	0.0E+00	7.4E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	2.3E-04	0.0E+00	2.3E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1a-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	3.6E+02*	5.4E+00*	3.6E+02*	0.0E+00
BENZENE	1.1E+03	1.3E+00	1.3E+00	2.4E-02	1.9E+01*	1.9E+01*	3.8E+00
BENZOTHIAZOLE	2.2E+04	7.6E+01	7.6E+01	1.2E-02	3.4E+00*	3.4E+00*	0.0E+00
BICYCLOHEPTADIENE	1.8E+05	5.3E+02	5.3E+02	3.4E-04	1.1E-01*	1.1E-01*	0.0E+00
CARBON TETRACHLORIDE	2.5E+02	4.0E-01	4.0E-01	3.6E-02	2.2E+01*	2.3E+01*	5.3E+02
CHLORDANE	2.5E+01	1.4E+04	2.5E+01	1.8E-02	3.2E-05	1.8E-02	0.0E+00
CHLOROBENZENE	8.8E+04	5.4E+01	5.4E+01	1.1E-05	1.9E-02	1.9E-02	4.0E-01
CHLOROFORM	5.1E+03	1.2E+01	1.2E+01	2.0E-03	8.6E-01*	8.6E-01*	2.3E+00
CHLOROPHENYLMETHYL SULFIDE	9.1E+04	4.9E+02	4.8E+02	1.2E-03	2.3E-01*	2.3E-01*	0.0E+00
CHLOROPHENYLMETHYL SULFONE	9.1E+04	1.9E+04	1.6E+04	2.2E-04	1.1E-03	1.3E-03	1.5E-06
CHLOROPHENYLMETHYL SULFOXIDE	9.1E+04	4.2E+02	4.1E+02	4.7E-05	1.0E-02	1.0E-02	1.2E-05
PPDDE	9.3E+01	1.9E+01	1.6E+01	2.0E-02	9.8E-02	1.2E-01*	0.0E+00
PPDDT	9.3E+01	1.9E+01	1.6E+01	2.9E-03	1.4E-02	1.7E-02	0.0E+00
DIBROMOCHLOROPROPANE	2.3E+01	6.9E-02	6.9E-02	3.1E+01*	1.0E+04*	1.0E+04*	6.7E-01
1,2-DICHLOROETHANE	3.5E+02	1.9E+00	1.9E+00	1.3E-03	2.4E-01*	2.4E-01*	0.0E+00
1,1-DICHLOROETHYLENE	5.4E+01	1.4E-01	1.4E-01	3.9E-03	1.5E+00*	1.5E+00*	0.0E+00
DICYCLOPENTADIENE	1.7E+04	8.3E-01	8.3E-01	8.1E-03	1.7E+02*	1.7E+02*	0.0E+00
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	1.9E+02*	6.4E+00*	1.9E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	1.1E+03	1.1E+03	1.0E-04	3.3E-02	3.3E-02	3.5E-05
DIMETHYLDISULFIDE	3.7E+04	6.0E+01	6.0E+01	3.0E-03	1.8E+00*	1.8E+00*	0.0E+00
DIMETHYMETHYL PHOSPHONATE	8.2E+04	0.0E+00	8.2E+04	8.1E-06	0.0E+00	8.1E-06	0.0E+00
DITHIANE	4.6E+04	0.0E+00	4.6E+04	2.6E-04	0.0E+00	2.6E-04	0.0E+00
ENDRIN	1.4E+03	1.0E+06	1.3E+03	2.9E-01*	2.6E-02a	3.2E-01*	0.0E+00
ETHYLBENZENE	4.6E+05	6.4E+02	6.4E+02	2.2E-05	1.5E-02	1.5E-02	0.0E+00
FLUOROACETIC ACID	2.2E+01	0.0E+00	2.2E+01	8.8E-01*	0.0E+00	8.8E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.5E+03	1.1E-01	1.1E-01	7.3E+00*	3.5E+05*	3.5E+05*	0.0E+00
ISODRIN	3.2E+02	3.0E+03	2.9E+02	3.1E+00*	3.3E-01*	3.4E+00*	0.0E+00
METHYLISOBUTYL KETONE	2.2E+05	1.6E+02	1.6E+02	9.4E-05	1.3E-01*	1.3E-01*	0.0E+00
METHYLENE CHLORIDE	4.1E+03	2.8E+00	2.8E+00	2.4E-04	3.5E-01*	3.5E-01*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	6.3E+00	6.2E+00	1.5E-01*	1.6E+01*	1.6E+01*	1.8E-01
TOLUENE	1.4E+06	7.9E+03	7.9E+03	2.7E-04	4.8E-02	4.8E-02	3.8E-05
1,1,2-TRICHLOROETHANE	5.5E+02	2.9E+00	2.9E+00	3.7E-04	6.8E-02	6.9E-02	0.0E+00
TRICHLOROETHYLENE	2.9E+03	4.4E+01	4.3E+01	1.0E-03	6.8E-02	6.9E-02	5.9E+00
M-XYLENE	7.0E+06	5.5E+02	5.5E+02	1.7E-06	2.2E-02	2.2E-02	0.0E+00
O,P-XYLENE	7.0E+06	5.5E+02	5.5E+02	2.1E-06	2.7E-02	2.7E-02	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	9.7E-03	0.0E+00	9.7E-03	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	1.0E-02	0.0E+00	1.0E-02	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	3.2E-04	0.0E+00	3.2E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1a-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	1.5E+06	4.2E+01	1.2E-01	5.8E+03*	1.6E+01*	5.9E+03*	0.0E+00	0.0E+00
BENZENE	6.7E+01	3.6E+04	1.3E+00	1.3E+00	3.9E-01*	1.9E+01*	2.0E+01*	6.0E-05	1.2E+01
BENZOTHIAZOLE	4.0E+03	4.1E+06	2.3E+02	2.2E+02	6.5E-02	1.1E+00*	1.2E+00*	0.0E+00	0.0E+00
BICYCLOHEPTADIENE	3.3E+04	5.7E+07	1.6E+03	1.5E+03	1.8E-03	3.7E-02	3.9E-02	0.0E+00	0.0E+00
CARBON TETRACHLORIDE	1.5E+01	1.2E+04	4.0E-01	3.9E-01	5.9E-01*	2.2E+01*	2.3E+01*	8.3E-03	1.6E+03
CHLORDANE	1.5E+00	1.6E+08	5.2E+00	1.2E+00	2.9E-01*	8.5E-02	3.7E-01*	0.0E+00	0.0E+00
CHLOROBENZENE	1.5E+04	5.8E+06	1.6E+02	1.6E+02	6.6E-05	6.2E-03	6.3E-03	2.1E-06	4.0E-01
CHLOROFORM	3.1E+02	1.1E+05	1.2E+01	1.1E+01	3.2E-02	8.6E-01*	8.9E-01*	3.6E-05	6.9E+00
CHLOROPHENYLMETHYL SULFIDE	1.7E+04	1.0E+06	1.0E+06	1.3E+03	6.6E-03	7.5E-02a	8.2E-02	0.0E+00	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.7E+04	4.2E+07	5.7E+04	1.3E+04	1.2E-03	3.5E-04	1.5E-03	7.6E-12	1.5E-06
CHLOROPHENYLMETHYL SULFOXIDE	1.7E+04	1.5E+07	4.2E+02	4.0E+02	2.6E-04	1.0E-02	1.1E-02	6.2E-11	1.2E-05
PPDDE	5.7E+00	9.2E+07	1.9E+01	4.4E+00	3.3E-01*	9.8E-02	4.3E-01*	0.0E+00	0.0E+00
PPDDT	5.7E+00	1.9E+08	1.9E+01	4.4E+00	4.7E-02	1.4E-02	6.1E-02	0.0E+00	0.0E+00
DIBROMOCHLOROPROPANE	1.4E+00	6.4E+02	6.9E-02	6.6E-02	5.0E+02*	1.0E+04*	1.1E+04*	1.0E-05	2.0E+00
1,2-DICHLOROETHANE	2.2E+01	3.8E+04	1.9E+00	1.7E+00	2.1E-02	2.4E-01*	2.6E-01*	0.0E+00	0.0E+00
1,1-DICHLOROETHYLENE	3.2E+00	2.9E+03	1.4E-01	1.4E-01	6.5E-02	1.5E+00*	1.5E+00*	0.0E+00	0.0E+00
DICYCLOPENTADIENE	1.2E+03	4.8E+04	2.5E+00	2.5E+00	1.2E-01*	5.6E+01*	5.6E+01*	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	6.9E+05	1.9E+01	1.2E-01	3.0E+03*	1.9E+01*	3.0E+03*	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	4.3E+07	3.3E+03	3.2E+03	5.5E-04	1.1E-02	1.2E-02	1.8E-10	3.5E-05
DIMETHYLDISULFIDE	6.9E+03	6.5E+06	1.8E+02	1.8E+02	1.6E-02	6.1E-01*	6.3E-01*	0.0E+00	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	4.4E-05	0.0E+00	4.4E-05	0.0E+00	0.0E+00
DITHIANE	8.5E+03	0.0E+00	0.0E+00	8.5E+03	1.4E-03	0.0E+00	1.4E-03	0.0E+00	0.0E+00
ENDRIN	2.5E+02	1.0E+06	1.0E+06	2.5E+02	1.6E+00*	2.6E-02a	1.6E+00*	0.0E+00	0.0E+00
ETHYLBENZENE	8.5E+04	5.8E+07	1.9E+03	1.9E+03	1.2E-04	5.1E-03	5.2E-03	0.0E+00	0.0E+00
FLUOROACETIC ACID	4.0E+00	0.0E+00	0.0E+00	4.0E+00	4.8E+00*	0.0E+00	4.8E+00*	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	5.9E+05	3.4E-01	3.4E-01	1.0E+02*	1.2E+05*	1.2E+05*	0.0E+00	0.0E+00
ISODRIN	5.9E+01	1.1E+08	3.0E+03	5.8E+01	1.7E+01*	3.3E-01*	1.7E+01*	0.0E+00	0.0E+00
METHYL ISOBUTYL KETONE	4.0E+04	1.7E+07	4.8E+02	4.8E+02	5.3E-04	4.3E-02	4.4E-02	0.0E+00	0.0E+00
METHYLENE CHLORIDE	2.5E+02	7.5E+04	2.8E+00	2.8E+00	4.0E-03	3.5E-01*	3.6E-01*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	1.6E+05	6.3E+00	5.5E+00	2.4E+00*	1.6E+01*	1.8E+01*	2.8E-06	5.4E-01
TOLUENE	2.6E+05	4.6E+08	2.4E+04	2.2E+04	1.5E-03	1.6E-02	1.7E-02	2.0E-10	3.8E-05
1,1,2-TRICHLOROETHANE	3.4E+01	5.9E+04	2.9E+00	2.7E+00	6.0E-03	6.8E-02	7.4E-02	0.0E+00	0.0E+00
TRICHLOROETHYLENE	1.8E+02	6.9E+04	4.4E+01	3.5E+01	1.7E-02	6.8E-02	8.5E-02	9.3E-05	1.8E+01
M-XYLENE	8.8E+05	5.0E+07	1.7E+03	1.7E+03	1.4E-05	7.2E-03	7.2E-03	0.0E+00	0.0E+00
O,P-XYLENE	8.8E+05	5.0E+07	1.7E+03	1.7E+03	1.7E-05	9.0E-03	9.1E-03	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	4.6E-01*	0.0E+00	4.6E-01*	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.1E-02	0.0E+00	3.1E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	9.8E-04	0.0E+00	9.8E-04	0.0E+00	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.2 SITE CSA-1b: COMPLEX DISPOSAL AREA SOUTH (formerly Site 36-17: Complex Disposal Activity; ESE, 1988b/RIC 88013R05 and ESE, 1988c/ RIC 88013R05A; Site 36-16: Incendiary Burial Site; ESE, 1988d/RIC 88293R08)

2.2.1 Site-Specific Considerations

Figure CSA-1b-1 and Tables CSA-1b-1 and CSA-1b-2 depict the target contaminants for Site CSA-1b. Borings 3089 through 3104, 3213 through 3215, 3329, 3330, 3336 through 3338, 3462 through 3465, 3654 through 3682, 3030, 3468 through 3470, and 3651, were included in this exposure assessment, consistent with the Central SAR. This site includes a portion of former Site 36-16, and part of Sites 36-1 and 36-14, which were designated as separate sites during the Phase I investigation, but were incorporated into former Site 36-17 during the Phase II investigation. According to the site history, no chemicals from the RMA target contaminant list other than bicycloheptadiene, carbon tetrachloride, Parathion, Vapona, and xylene were suspected to be present in Site CSA-1b (ESE, 1988b/RIC 88013R05). However, many nontarget compounds are suspected to have been handled or stored at the site.

2.2.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-1b are depicted in Figure CSA-1b-1. Toluene, occurring in Boring 3101 (0-1 ft), was not included in the figure, since it was detected in the nontarget analysis during the Phase I investigation, but it is still considered a target contaminant for this exposure assessment (see Appendix A).

Table CSA-1b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-1b-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.2.3 Site Exposure Summary

Tables CSA-1b-3 through CSA-1b-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-1b is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Direct	Dir/Ind
Chlordane	Direct	Direct	Direct	Direct	Direct
PPDDT	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Dibromochloropropane	Cumulative	Cumulative	Dir/Ind	Indirect	Dir/Ind
Dieldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Fluoroacetic acid	Direct	Direct	Direct	Direct	Direct
Arsenic	Direct	Direct	Direct	Direct	Direct
Benzene	--	--	--	Indirect	Indirect
Methylene chloride	--	--	--	Indirect	Indirect
Chloroacetic acid	--	--	--	--	Direct
PPDDE	--	--	--	--	Direct

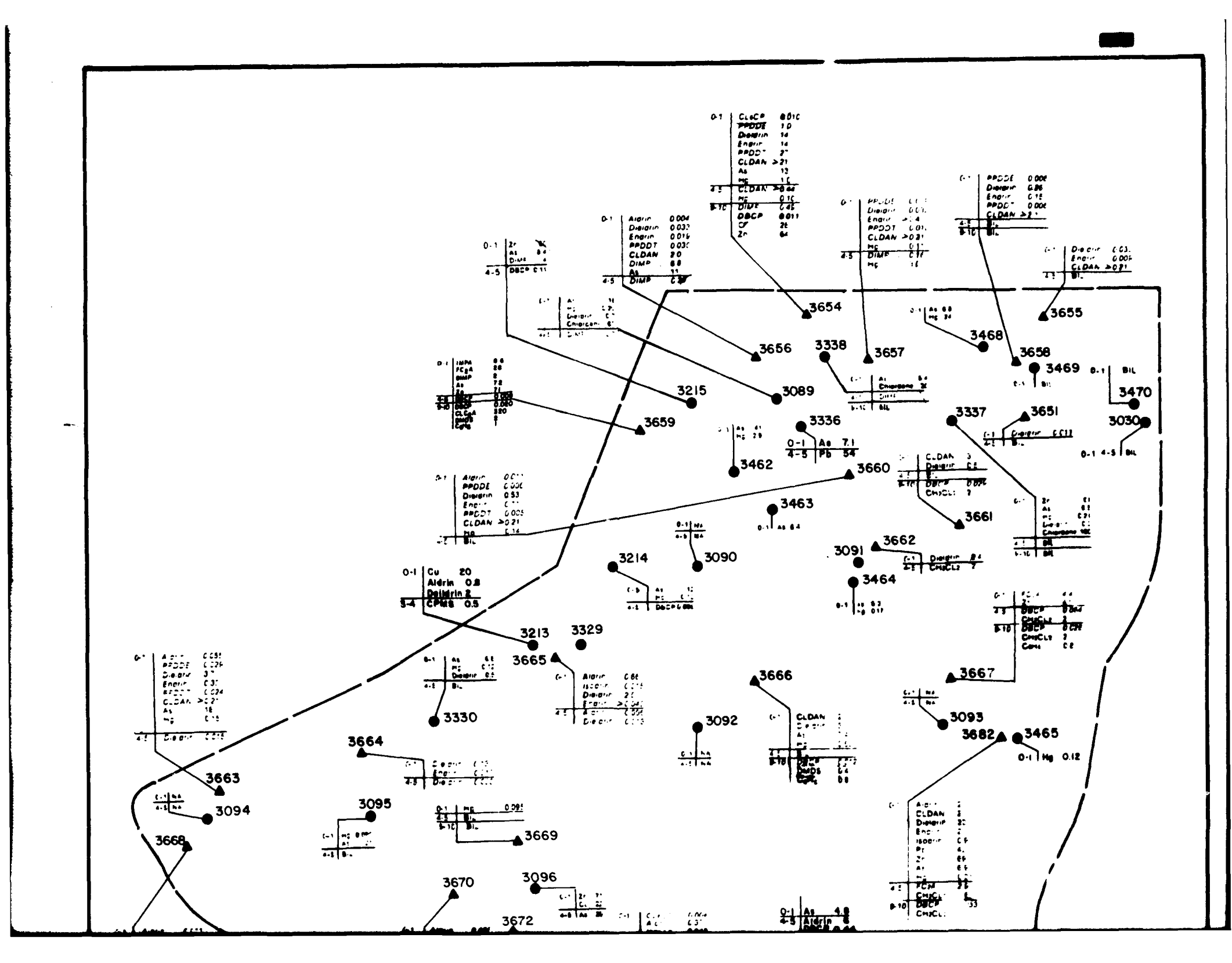
Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

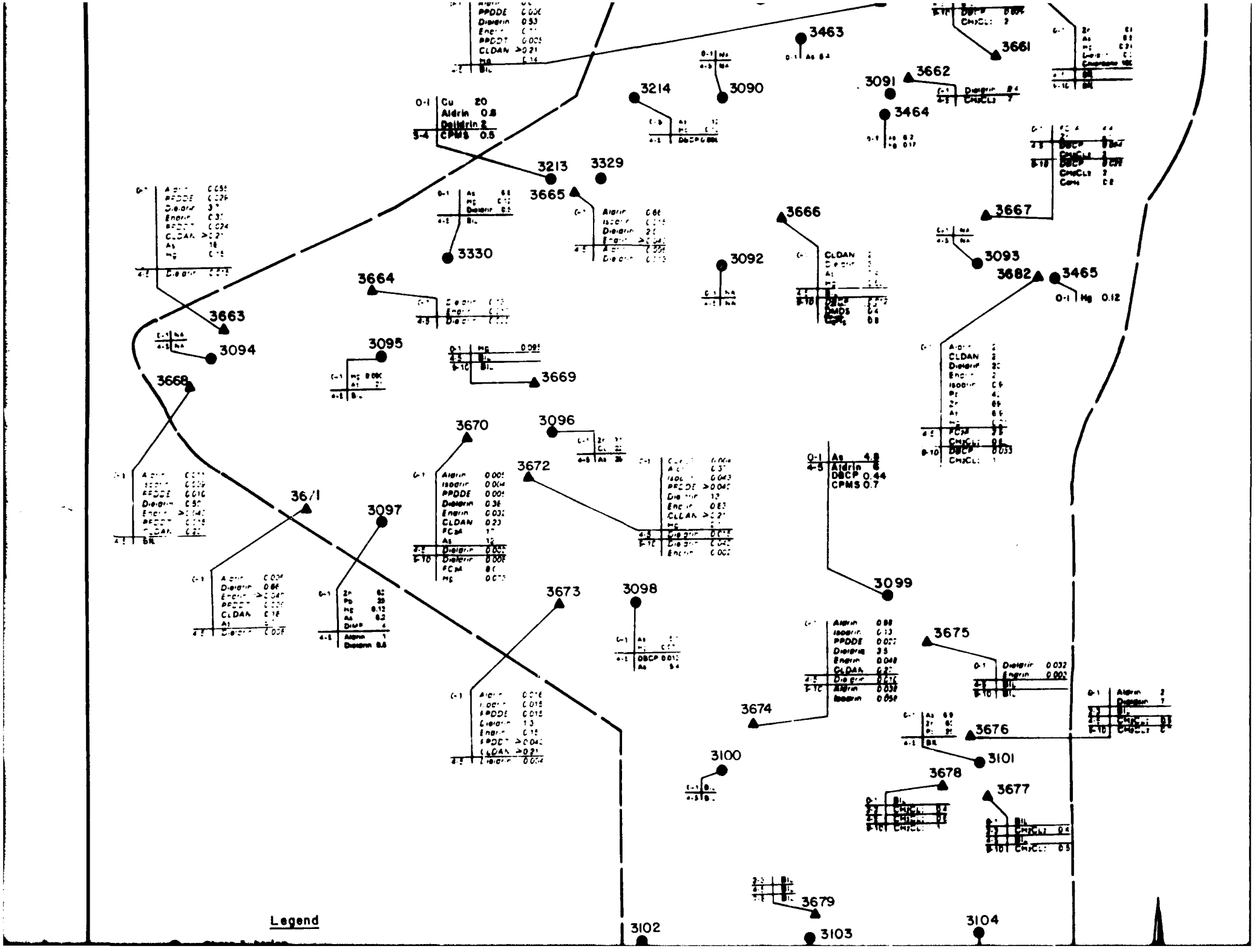
The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. It should be noted for dibromochloropropane, the cumulative EI exceeds 0.1 for the regulated and casual visitors but the direct and indirect EIs do not exceed 0.1. Site CSA-1b is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

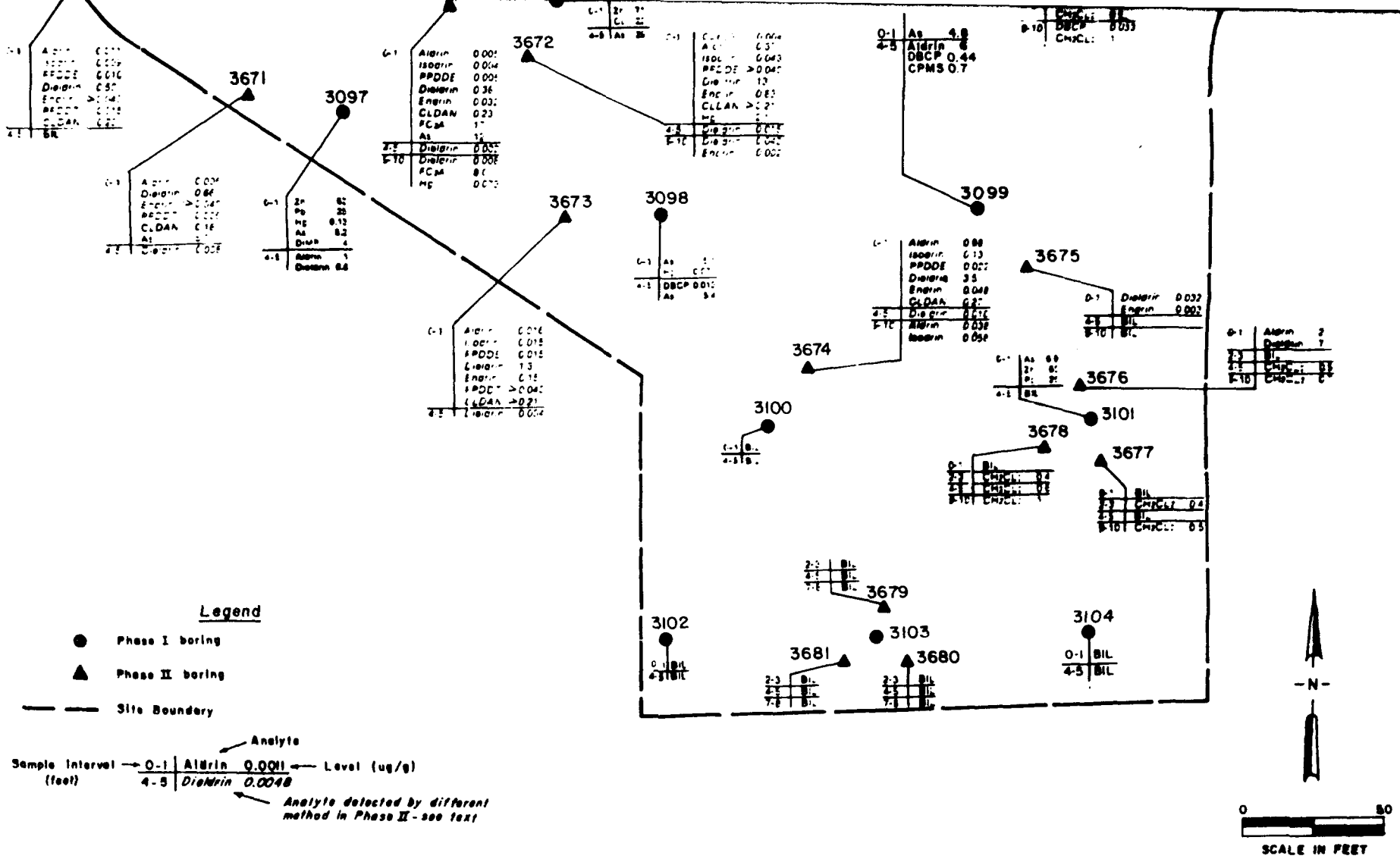
The following groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by a VEI value greater than 1:

- Carbon tetrachloride (open, enclosed)

- Benzene (enclosed)
- Chloroform (enclosed)
- Dibromochloropropane (enclosed)
- Trichloroethylene (enclosed)


3654
3655
3656
3338
3657
3468
3658
3469
3470
3030
3089
3215
3659
3336
3337
3651
3462
3660
3661
3463
3662
3091
3464
3214
3090
3213
3329
3665
3330
3666
3667
3092
3093
3682
3465
3664
3663
3094
3095
3669
3668
3670
3096
3672


3463
3661
3662
3091
3464
3214
3090
3213
3329
3665
3330
3666
3667
3093
3092
3682
3465
0-1 Hg 0.12
3663
3094
3664
3095
3669
3668
3096
3670
3672
3671
3097
3673
3098
3099
3675
3674
3676
3101
3100
3678
3677
3679
3102
3103
3104
Legend



BIL - Below Indicator Level

C6H6 - Benzene
CLDAN - Chlordane
CLC2A - Chloroacetic acid
CPMS - Chlorophenylmethyl sulfide
DBCP - Dibromochloropropane
PPDDE - 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
PPDDT - 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
DIMP - Dimethylmethyl phosphonate
DMDS - Dimethyldisulfide
PC2A - Phenoxyacetic acid
CL6CP - Hexachlorocyclopentadiene
DMPA - Isopropyl methyl phosphonic acid
C1I2CL2 - Methylene chloride
As - Arsenic
Pb - Lead
Hg - Mercury
Cu - Copper
Zn - Zinc

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

FIGURE CSA-1b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE CSA-1b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1b

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	6	4-5	3099	6	4-5	3099
Benzene	1	9-10	3659	1	9-10	3659
Chlordane	100	0-1	3337	100	0-1	3337
Chloroacetic acid	320	9-10	3659	320	9-10	3659
Chlorophenylmethyl sulfide	0.7	4-5	3099	0.7	4-5	3099
Dibromochloropropane	0.44	4-5	3099	0.44	4-5	3099
PPDDE[1/]	1.0	0-1	3654	1.0	0-1	3654
PPDDT[2/]	27	0-1	3654	27	0-1	3654
Dieldrin	14	0-1	3654	14	0-1	3654
Diisopropylmethyl phosphonate	6.8	0-1	3656	6.8	0-1	3656
Dimethyldisulfide	2	9-10	3659	2	9-10	3659
Endrin	14	0-1	3654	14	0-1	3654
Fluoroacetic acid	28	0-1	3659	28	0-1	3659
Hexachlorocyclopentadiene	0.010	0-1	3654	0.010	0-1	3654
Isodrin	0.9	0-1	3682	0.9	0-1	3682
Isopropylmethyl phosphonic acid	8.6	0-1	3659	8.6	0-1	3659
Methylene chloride	2	4-5	3662	2	4-5	3662
		4-5	3667		4-5	3667
		9-10	3661		9-10	3661
		9-10	3667		9-10	3667
Toluene	2	0-1	3101	2	0-1	3101

TABLE CSA-1b-1 (Continued)
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1b

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Arsenic	41	0-1	3462	--	--	--
Lead	54	4-5	3336	--	--	--
Mercury	24	0-1	3468	--	--	--

1/ PPDDE 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
2/ PPDDT 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
3/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

CSA Central Study Area
Max. Maximum
ug/g microgram per gram
ft foot/feet

TABLE CSA-1b-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1b

AVERAGE SITE DEPTH TO GROUNDWATER: 14 Feet

CHEMICAL	CONCENTRATION MAXIMUM		LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE		250	36592	02/16/88
CARBON TETRACHLORIDE		2000	36592	02/16/88
CHLOROFORM		1000	36592	02/16/88
CHLOROBENZENE	GT	1000	36592	02/16/88
CHLOROPHENYLMETHYL SULFIDE		40	36592	02/16/88
CHLOROPHENYLMETHYL SULFOXIDE		32	36592	02/16/88
CHLOROPHENYLMETHYL SULFONE		7.6	36592	02/16/88
DIBROMOCHLOROPROPANE		21	36592	02/16/88
DIISOPROPYLMETHYL PHOSPHONATE		33	36592	02/16/88
DIMETHYLMETHYL PHOSPHONATE		1.1	36065	01/4/89
TOLUENE		5.4	36065	01/4/89
TETRACHLOROETHYLENE		26	36592	02/16/88
TRICHLOROETHYLENE		440	36592	02/16/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-1b-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	4.7E+03	1.5E+00	4.0E+00*	1.3E-03	4.0E+00*	0.0E+00
BENZENE	8.6E+02	2.6E+02	2.0E+02	1.2E-03	3.9E-03	5.1E-03	1.9E-02
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	2.7E+00
CHLORDANE	2.0E+01	5.1E+05	2.0E+01	5.1E+00*	2.0E-04	5.1E+00*	0.0E+00
CHLOROACETIC ACID	1.7E+04	0.0E+00	1.7E+04	1.9E-02	0.0E+00	1.9E-02	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	6.7E-04
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-02
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	3.5E+05	1.1E+05	4.3E-06	2.0E-06	6.3E-06	1.1E-06
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.4E-09
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-08
PPDDE	7.4E+01	2.9E+05	7.4E+01	1.4E-02	3.5E-06	1.4E-02	0.0E+00
PPDDT	7.4E+01	1.0E+06	7.4E+01	3.7E-01*	4.5E-05a	3.7E-01*	0.0E+00
DIBROMOCHLOROPROPANE	1.8E+01	5.4E+00	4.1E+00	2.4E-02	8.2E-02	1.1E-01*	3.4E-03
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	8.9E+00*	6.5E-03a	8.9E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	8.4E+04	7.4E+04	1.0E-05	8.1E-05	9.2E-05	5.9E-08
DIMETHYLDISULFIDE	6.7E+04	2.6E+04	1.9E+04	3.0E-05	7.6E-05	1.1E-04	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	5.6E-03	8.0E-06a	5.7E-03	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	7.2E-01*	0.0E+00	7.2E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	8.6E+01	8.6E+01	6.0E-07	1.2E-04	1.2E-04	0.0E+00
ISODRIN	5.8E+02	3.4E+05	5.8E+02	1.6E-03	2.6E-06	1.6E-03	0.0E+00
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+06	0.0E+00	2.5E+06	3.5E-06	0.0E+00	3.5E-06	0.0E+00
METHYLENE CHLORIDE	3.3E+03	1.7E+02	1.6E+02	6.1E-04	1.2E-02	1.2E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	9.0E-04
TOLUENE	2.5E+06	2.2E+06	1.2E+06	8.0E-07	8.9E-07	1.7E-06	6.4E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	3.0E-02
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.9E+00*	0.0E+00	1.9E+00*	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.5E-03	0.0E+00	3.5E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.3E-03	0.0E+00	7.3E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1b-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	4.7E+03	1.5E+00	4.0E+00*	1.3E-03	4.0E+00*	0.0E+00
BENZENE	8.6E+02	2.6E+02	2.0E+02	1.2E-03	3.9E-03	5.1E-03	1.9E-02
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	2.7E+00
CHLORDANE	2.0E+01	5.1E+05	2.0E+01	5.1E+00*	2.0E-04	5.1E+00*	0.0E+00
CHLOROACETIC ACID	1.7E+04	0.0E+00	1.7E+04	1.9E-02	0.0E+00	1.9E-02	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	6.7E-04
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-02
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	3.5E+05	1.1E+05	4.3E-06	2.0E-06	6.3E-06	1.1E-06
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.4E-09
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-08
PPDDE	7.4E+01	2.9E+05	7.4E+01	1.4E-02	3.5E-06	1.4E-02	0.0E+00
PPDDT	7.4E+01	1.0E+06	7.4E+01	3.7E-01*	4.5E-05a	3.7E-01*	0.0E+00
DIBROMOCHLOROPROPANE	1.8E+01	5.4E+00	4.1E+00	2.4E-02	8.2E-02	1.1E-01*	3.4E-03
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	8.9E+00*	6.5E-03a	8.9E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	8.4E+04	7.4E+04	1.0E-05	8.1E-05	9.2E-05	5.9E-08
DIMETHYLDISULFIDE	6.7E+04	2.6E+04	1.9E+04	3.0E-05	7.6E-05	1.1E-04	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	5.6E-03	8.0E-06a	5.7E-03	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	7.2E-01*	0.0E+00	7.2E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	8.6E+01	8.6E+01	6.0E-07	1.2E-04	1.2E-04	0.0E+00
ISODRIN	5.8E+02	3.4E+05	5.8E+02	1.6E-03	2.6E-06	1.6E-03	0.0E+00
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+06	0.0E+00	2.5E+06	3.5E-06	0.0E+00	3.5E-06	0.0E+00
METHYLENE CHLORIDE	3.3E+03	1.7E+02	1.6E+02	6.1E-04	1.2E-02	1.2E-02	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	9.0E-04
TOLUENE	2.5E+06	2.2E+06	1.2E+06	8.0E-07	8.9E-07	1.7E-06	6.4E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	3.0E-02
ARSENIC	2.2E+01	0.0E+00	2.2E+01	1.9E+00*	0.0E+00	1.9E+00*	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.5E-03	0.0E+00	3.5E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	7.3E-03	0.0E+00	7.3E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1b-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	3.1E+02	2.1E-01	2.9E+01*	1.9E-02	2.9E+01*	0.0E+00
BENZENE	1.2E+02	4.0E+01	3.0E+01	8.4E-03	2.5E-02	3.4E-02	2.9E-01
CARBON TETRACHLORIDE	2.7E+01	0.0E+00	2.7E+01	0.0E+00	0.0E+00	0.0E+00	4.1E+01
CHLORDANE	2.7E+00	3.4E+04	2.7E+00	3.7E+01*	3.0E-03	3.7E+01*	0.0E+00
CHLOROACETIC ACID	7.0E+03	0.0E+00	7.0E+03	4.5E-02	0.0E+00	4.5E-02	0.0E+00
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	4.3E-03
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-01
CHLOROPHENYLMETHYL SULFIDE	7.0E+04	5.5E+04	3.1E+04	1.0E-05	1.3E-05	2.3E-05	6.9E-06
CHLOROPHENYLMETHYL SULFONE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.6E-08
CHLOROPHENYLMETHYL SULFOXIDE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.3E-07
PPDDE	1.0E+01	1.9E+04	1.0E+01	9.8E-02	5.3E-05	9.8E-02	0.0E+00
PPDDT	1.0E+01	1.0E+06	1.0E+01	2.6E+00*	6.8E-04a	2.6E+00*	0.0E+00
DIBROMOCHLOROPROPANE	2.5E+00	3.5E-01	3.1E-01	1.8E-01*	1.2E+00*	1.4E+00*	5.1E-02
DIELDRIN	2.2E-01	1.0E+06	2.2E-01	6.4E+01*	9.8E-02a	6.4E+01*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	3.0E+04	2.7E+04	2.4E-05	2.2E-04	2.5E-04	3.8E-07
DIMETHYLDISULFIDE	2.9E+04	9.5E+03	7.1E+03	7.0E-05	2.1E-04	2.8E-04	0.0E+00
DIMETHYMETHYL PHOSPHONATE	6.3E+04	0.0E+00	6.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.1E+03	1.0E+06	1.1E+03	1.3E-02	5.2E-05a	1.3E-02	0.0E+00
FLUOROACETIC ACID	1.7E+01	0.0E+00	1.7E+01	1.7E+00*	0.0E+00	1.7E+00*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	3.1E+01	3.1E+01	1.8E-06	3.2E-04	3.2E-04	0.0E+00
ISODRIN	2.5E+02	5.3E+04	2.5E+02	3.7E-03	1.7E-05	3.7E-03	0.0E+00
ISOPROPYL METHYL PHOSPHONIC ACID	1.1E+06	0.0E+00	1.1E+06	8.1E-06	0.0E+00	8.1E-06	0.0E+00
METHYLENE CHLORIDE	4.5E+02	2.7E+01	2.5E+01	4.4E-03	7.5E-02	7.9E-02	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	0.0E+00	7.1E+01	0.0E+00	0.0E+00	0.0E+00	1.4E-02
TOLUENE	1.1E+06	8.1E+05	4.6E+05	1.9E-06	2.5E-06	4.4E-06	4.1E-07
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	4.5E-01
ARSENIC	3.9E+00	0.0E+00	3.9E+00	1.0E+01*	0.0E+00	1.0E+01*	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	5.8E-03	0.0E+00	5.8E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.2E-02	0.0E+00	1.2E-02	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1b-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	3.2E+00*	4.8E-02	3.2E+00*	0.0E+00
BENZENE	1.1E+03	2.3E+00	2.3E+00	9.2E-04	4.4E-01*	4.4E-01*	3.8E+00
CARBON TETRACHLORIDE	2.5E+02	0.0E+00	2.5E+02	0.0E+00	0.0E+00	0.0E+00	5.3E+02
CHLORDANE	2.5E+01	1.4E+04	2.5E+01	4.0E+00*	7.4E-03	4.1E+00*	0.0E+00
CHLOROACETIC ACID	9.2E+03	0.0E+00	9.2E+03	3.5E-02	0.0E+00	3.5E-02	0.0E+00
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	4.0E-01
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	2.3E+00
CHLOROPHENYLMETHYL SULFIDE	9.1E+04	1.7E+02	1.7E+02	7.7E-06	4.0E-03	4.0E-03	6.4E-04
CHLOROPHENYLMETHYL SULFONE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	1.5E-06
CHLOROPHENYLMETHYL SULFOXIDE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	1.2E-05
PPDDE	9.3E+01	1.9E+01	1.6E+01	1.1E-02	5.1E-02	6.2E-02	0.0E+00
PPDDT	9.3E+01	1.9E+01	1.6E+01	2.9E-01*	1.4E+00*	1.7E+00*	0.0E+00
DIBROMOCHLOROPROPANE	2.3E+01	4.4E-02	4.4E-02	1.9E-02	1.0E+01*	1.0E+01*	6.7E-01
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	7.0E+00*	2.4E-01*	7.3E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	7.0E+02	7.0E+02	1.9E-05	9.7E-03	9.7E-03	3.5E-05
DIMETHYLDISULFIDE	3.7E+04	7.8E+01	7.7E+01	5.4E-05	2.6E-02	2.6E-02	0.0E+00
DIMETHYMETHYL PHOSPHONATE	8.2E+04	0.0E+00	8.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.4E+03	1.0E+06	1.3E+03	1.0E-02	9.0E-04a	1.1E-02	0.0E+00
FLUOROACETIC ACID	2.2E+01	0.0E+00	2.2E+01	1.3E+00*	0.0E+00	1.3E+00*	0.0E+00
HEXACH LOPENTADIENE	5.5E+03	1.9E+01	1.9E+01	1.8E-06	5.2E-04	5.2E-04	0.0E+00
ISODRI	3.2E+02	3.0E+03	2.9E+02	2.8E-03	3.0E-04	3.1E-03	0.0E+00
ISOPROPYL METHYL PHOSPHONIC ACID	1.4E+06	0.0E+00	1.4E+06	6.3E-06	0.0E+00	6.3E-06	0.0E+00
METHYLENE CHLORIDE	4.1E+03	4.4E+00	4.4E+00	4.9E-04	4.6E-01*	4.6E-01*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	0.0E+00	6.5E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-01
TOLUENE	1.4E+06	5.5E+05	3.9E+05	1.4E-06	3.7E-06	5.1E-06	3.8E-05
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	5.9E+00
ARSENIC	2.0E+01	0.0E+00	2.0E+01	2.1E+00*	0.0E+00	2.1E+00*	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	8.3E-03	0.0E+00	8.3E-03	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.7E-02	0.0E+00	1.7E-02	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1b-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	6.3E+02	4.2E+01	1.2E-01	5.2E+01*	1.5E-01*	5.2E+01*	0.0E+00	0.0E+00
BENZENE	6.7E+01	3.4E+01	2.3E+00	2.1E+00	1.5E-02	4.7E-01*	4.8E-01*	1.5E-01	1.2E+01
CARBON TETRACHLORIDE	1.5E+01	0.0E+00	0.0E+00	1.5E+01	0.0E+00	0.0E+00	0.0E+00	2.0E+01	1.6E+03
CHLORDANE	1.5E+00	6.8E+04	4.5E+03	1.5E+00	6.6E+01*	2.4E-02	6.6E+01*	0.0E+00	0.0E+00
CHLOROACETIC ACID	1.7E+03	0.0E+00	0.0E+00	1.7E+03	1.9E-01*	0.0E+00	1.9E-01*	0.0E+00	0.0E+00
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	5.0E-03	4.0E-01
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	8.7E-02	6.9E+00
CHLOROPHENYLMETHYL SULFIDE	1.7E+04	4.7E+04	5.2E+02	5.0E+02	4.2E-05	1.4E-03	1.4E-03	8.0E-06	6.4E-04
CHLOROPHENYLMETHYL SULFONE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.8E-08	1.5E-06
CHLOROPHENYLMETHYL SULFOXIDE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.5E-07	1.2E-05
PPDDE	5.7E+00	3.8E+04	1.9E+01	4.4E+00	1.7E-01*	5.1E-02	2.3E-01*	0.0E+00	0.0E+00
PPDDT	5.7E+00	8.0E+04	1.9E+01	4.4E+00	4.7E+00*	1.4E+00*	6.1E+00*	0.0E+00	0.0E+00
DIBROMOCHLOROPROPANE	1.4E+00	7.2E-01	4.4E-02	4.0E-02	3.1E-01*	1.1E+01*	1.1E+01*	2.5E-02	2.0E+00
DIELDRIN	1.2E-01	2.9E+02	1.9E+01	1.2E-01	1.1E+02*	7.8E-01*	1.2E+02*	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	1.1E+04	2.1E+03	1.7E+03	1.0E-04	3.8E-03	3.9E-03	4.4E-07	3.5E-05
DIMETHYLDISULFIDE	6.9E+03	3.5E+03	2.3E+02	2.1E+02	2.9E-04	9.2E-03	9.5E-03	0.0E+00	0.0E+00
DIMETHYMETHYL PHOSPHONATE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+02	1.0E+06	1.0E+06	2.5E+02	5.5E-02	9.6E-04a	5.6E-02	0.0E+00	0.0E+00
FLUOROACETIC ACID	4.0E+00	0.0E+00	0.0E+00	4.0E+00	7.0E+00*	0.0E+00	7.0E+00*	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	1.1E+01	5.8E+01	9.3E+00	2.6E-05	1.0E-03	1.1E-03	0.0E+00	0.0E+00
ISODRIN	5.9E+01	4.6E+04	3.0E+03	5.8E+01	1.5E-02	3.2E-04	1.6E-02	0.0E+00	0.0E+00
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+05	0.0E+00	0.0E+00	2.5E+05	3.4E-05	0.0E+00	3.4E-05	0.0E+00	0.0E+00
METHYLENE CHLORIDE	2.5E+02	2.3E+01	4.4E+00	3.6E+00	8.1E-03	5.4E-01*	5.5E-01*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	6.8E-03	5.4E-01
TOLUENE	2.6E+05	3.0E+05	1.6E+06	1.3E+05	7.7E-06	7.9E-06	1.6E-05	4.8E-07	3.8E-05
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-01	1.8E+01
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	2.5E+01*	0.0E+00	2.5E+01*	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	2.5E-02	0.0E+00	2.5E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	5.2E-02	0.0E+00	5.2E-02	0.0E+00	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.3 SITE CSA-1c: COMPLEX DISPOSAL AREA NORTH (formerly Site 36-17: Complex Disposal Activity; ESE, 1988b/RIC 88013R05 and ESE, 1988c/ RIC 88013R05A; Site 36-16: Incendiary Burial Site; ESE, 1988d/RIC 88293R08; Site 36-9: Incendiary or Munition Test Area; ESE, 1988e/RIC 88293R05)

2.3.1 Site-Specific Considerations

Figure CSA-1c-1 and Tables CSA-1c-1 and CSA-1c-2 depict the target contaminants for Site CSA-1c. Borings 3059, 3061 through 3088, 3202, 3228, 3232 through 3234, 3320 through 3328, 3339 through 3341, 3480 through 3482, 3476, 3477, 3530, 3531, 3522, 3580 through 3585, 3587, 3588, 3590 through 3598, 3600, 3602, 3603, 3604 through 3609, 3614 through 3640, 3642 through 3644, 3646 through 3650, 3652, 3653, 3736, and 3738 were included in the exposure assessment, consistent with the Central SAR. This site includes former Site 36-9, and part of former Site 36-16, which were designated as separate sites during the Phase I investigation, but incorporated into former Site 36-17 during the Phase II investigation. According to the site history, no chemicals from the RMA target contaminant list, other than benzene and trichloroethylene, were suspected to be present in Site CSA-1c (ESE, 1988b/RIC 88013R05).

2.3.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-1c are depicted in Figure CSA-1c-1. Toluene occurring in Borings 3084 (9-10 and 14-15 ft), 3592 (2.5-3.5 ft), and 3600 (4-5 ft); tetrachloroethylene, occurring in Boring 3086 (4-5 ft); and xylene occurring in Borings 3584 (8-9 ft) and 3587 (7-8 ft) were not included in the figure because they were detected in the nontarget analysis, but they are still considered target contaminants for this exposure assessment (see Appendix A). The following contaminants were not included in the figure, since they were not considered target contaminants during the Phase I and Phase II investigations: methylphosphonic acid, occurring in Boring 3587 (7-8 ft); fluoranthene and pyrene, occurring in Borings 3340 (0-1 ft) and 3606 (6-7 ft); hexachlorobenzene, occurring in Borings 3584 (8-9 ft) and 3585 (14-15 ft); pentachlorobenzene, occurring in Boring 3584 (8-9 ft); phenanthrene, occurring in Boring 3340 (0-1 ft); 1,1,2,2-tetrachloroethane, occurring in Borings 3069 (0-1 and 4-5 ft), 3071 (0-1 ft), 3086 (2-3 ft) and 3600 (4-5 ft); and trichlorobenzene and trichloropropene, occurring in Boring 3581 (2-3 ft). Although not shown in this figure,

these nontarget compounds were included in the Central SAR and in this exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988a/RIC 88357R01). Methylene chloride, shown in Table CSA-1c-1, is excluded from consideration in the exposure analysis for this site because it was considered a laboratory contaminant in the samples analyzed.

Table CSA-1c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-1c-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.3.3 Site Exposure Summary

Tables CSA-1c-3 through CSA-1c-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-1c is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Dir/Ind	Dir/Ind	Dir/Ind
Chlordane	Direct	Direct	Direct	Direct	Direct
Dieldrin	Direct	Direct	Dir/Ind	Dir/Ind	Dir/Ind
Fluoroacetic acid	Direct	Direct	Direct	Direct	Direct
1,1,2,2-Tetrachloroethane	Dir/Ind	Dir/Ind	Dir/Ind	Dir/Ind	Dir/Ind
Tetrachloroethylene	Direct	Direct	Dir/Ind	Dir/Ind	Dir/Ind
Arsenic	Direct	Direct	Direct	Direct	Direct
Chromium	Direct	Direct	Direct	Direct	Direct
Lead	Direct	Direct	Direct	Direct	Direct

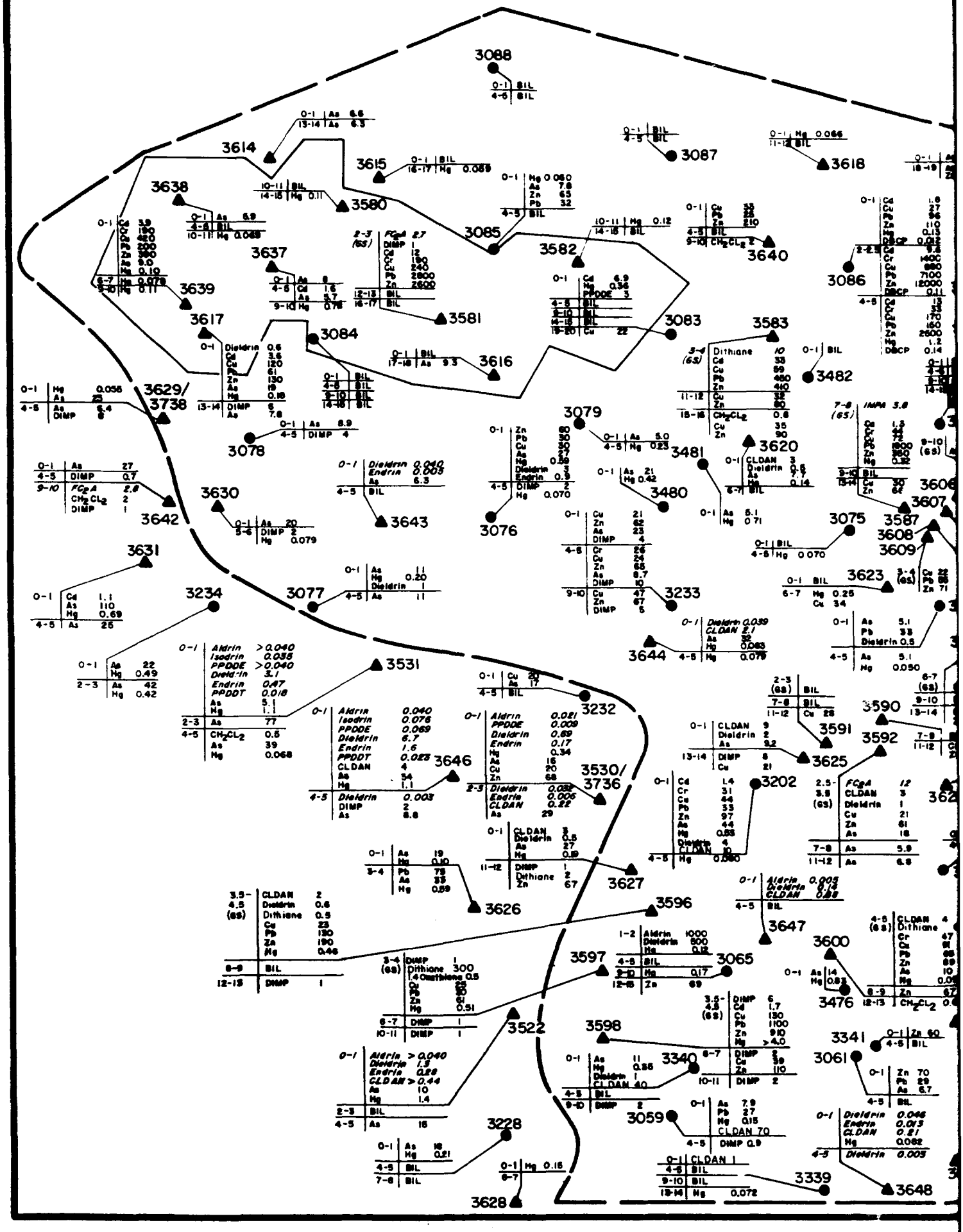
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
PPDDE	--	--	Direct	Indirect	Dir/Ind
Dibromochloropropane	--	--	Cumulative	--	Cumulative
Hexachlorocyclo-pentadiene	--	--	Indirect	Indirect	Indirect
Cadmium	--	--	Direct	--	Direct
Copper	--	--	Direct	Direct	Direct

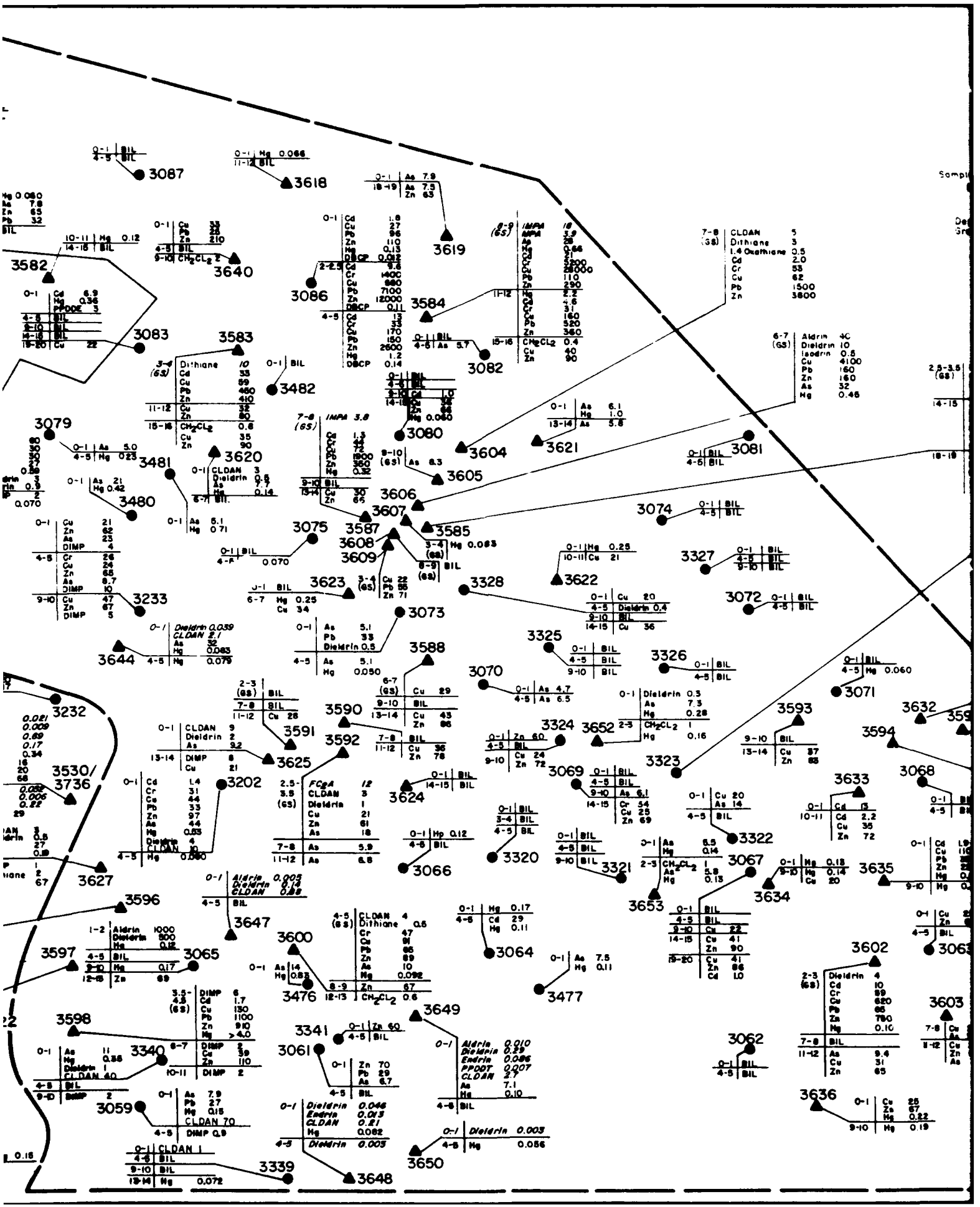
Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

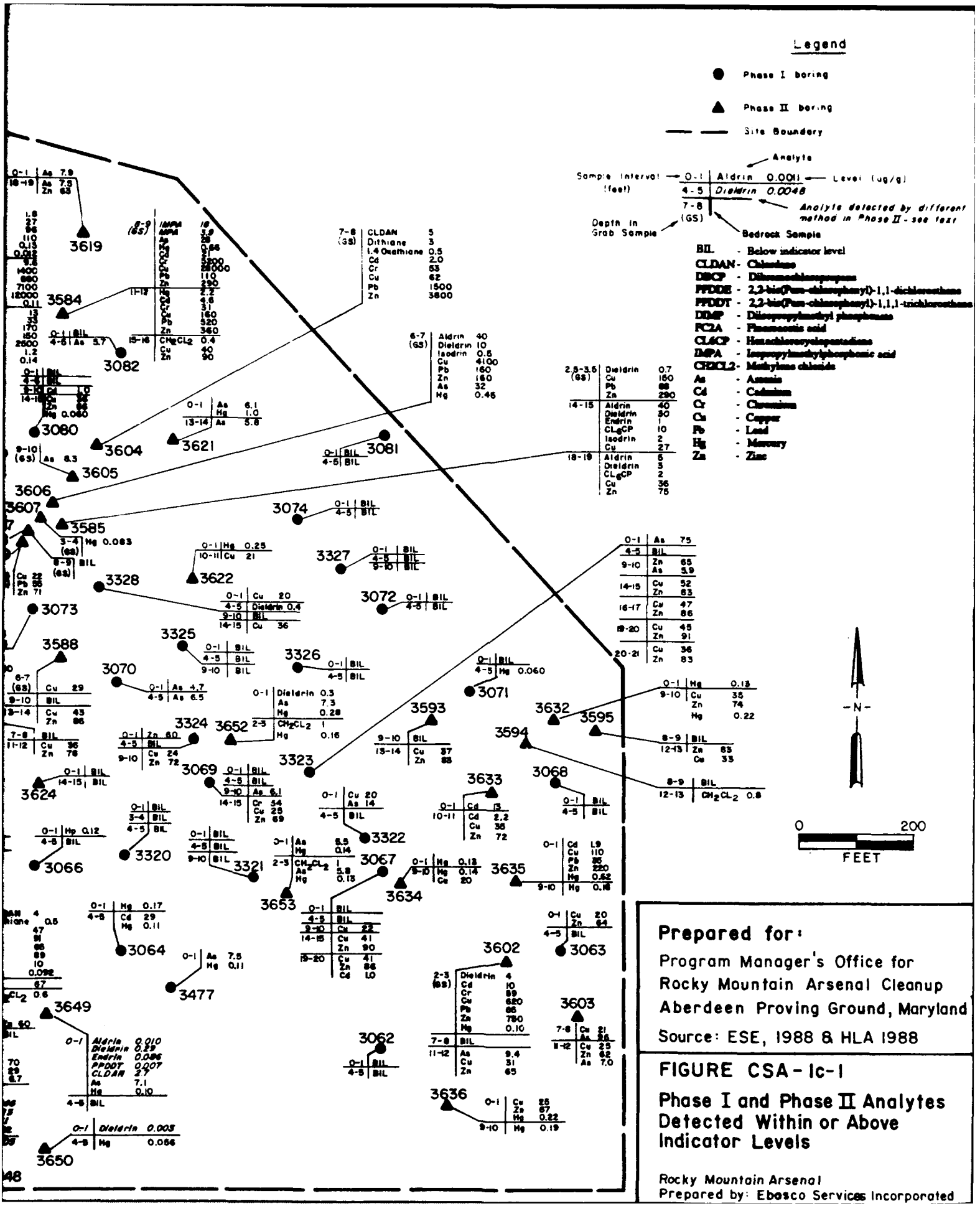
The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. It should be noted for dibromochloropropane, the cumulative EI exceeds 0.1 for the recreational visitor and industrial worker but the direct and indirect EIs do not exceed 0.1. Site CSA-1c is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

The following groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by a VEI value greater than 1:

- 1,1-Dichloroethylene (enclosed)
- Benzene (enclosed)
- Dibromochloropropane (enclosed)
- 1,2-Dichloroethane (enclosed)
- Trichloroethylene (enclosed)


3088
3614
3615
3638
3580
3085
3087
3618
3640
3637
3582
3086
3639
3581
3617
3084
3083
3583
3616
3482
3629/
3738
3079
3078
3620
3481
3630
3480
3607
3642
3643
3076
3075
3587
3608
3609
3631
3623
3234
3077
3233
3644
3590
3591
3592
3531
3232
3625
3646
3530/
3736
3202
3627
3626
3596
3647
3597
3065
3600
3476
3598
3522
3340
3341
3061
3059
3228
3339
3628
3648


3087
3618
3582
3640
3619
3086
3584
3082
3083
3583
3482
3079
3080
3604
3621
3620
3481
3605
3480
3606
3607
3587
3585
3608
3609
3075
3623
3622
3328
3073
3644
3588
3325
3326
3070
3590
3591
3592
3625
3324
3652
3323
3593
3594
3071
3232
3530/
3736
3202
3624
3633
3627
3066
3320
3321
3322
3067
3653
3634
3635
3596
3647
3597
3065
3600
3476
3064
3477
3602
3598
3649
3340
3341
3061
3062
3603
3059
3650
3339
3648
3636



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

Source: ESE, 1988 & HLA 1988

FIGURE CSA-Ic-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE CSA-1c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1c

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	1000	1-2	3065	1000	1-2	3065
Chlordane	70	0-1	3059	70	0-1	3059
Dibromochloropropane	0.14	4-5	3086	0.14	4-5	3086
PPDDE[1/]	3	0-1	3083	3	0-1	3083
PPDDT[2/]	0.023	0-1	3646	0.023	0-1	3646
Dieldrin	500	1-2	3065	500	1-2	3065
Diisopropylmethyl phosphonate	10	4-5	3233	10	4-5	3233
Dithiane	300	3-4	3597	300	3-4	3597
Endrin	1.6	0-1	3646	1.6	0-1	3646
Fluoranthene[3/]	5.0	6-7	3606	5.0	6-7	3606
Fluoroacetic acid	12	2.5-3.5	3592	12	2.5-3.5	3592
Hexachlorobenzene[3/]	6.0	8-9	3584	6.0	8-9	3584
Hexachlorocyclopentadiene	--	--	--	10	14-15	3585
Isopropylmethyl phosphonic acid	18	8-9	3584	18	8-9	3584
Isodrin	0.5	6-7	3606	2	14-15	3585
Methylene chloride[4/]	2	9-10	3640	2	9-10	3640
		9-10	3642		9-10	3642
Methylphosphonic acid[3/]	4.0	7-8	3587	4.0	7-8	3587
1,4-Oxathiane	0.5	3-4	3597	0.5	3-4	3597
		7-8	3604		7-8	3604
Pentachlorobenzene[3/]	1.0	8-9	3584	1.0	8-9	3584
Phenanthrene[3/]	3.0	0-1	3340	3.0	0-1	3340
Pyrene[3/]	3.0	6-7	3606	3.0	6-7	3606
1,1,2,2-Tetrachloroethane[3/]	600	2-3	3086	600	2-3	3086

TABLE CSA-1c-1 (Continued)
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1c

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Tetrachloroethylene	1000	4-5	3086	1000	4-5	3086
Toluene	2.0	4-5	3600	2.0	4-5	3600
Trichlorobenzene[3/]	1.0	2-3	3581	1.0	2-3	3581
Trichloropropene[3/]	2.0	2-3	3581	2.0	2-3	3581
o-, p-Xylene	2.0	7-8	3587	2.0	7-8	3587
		8-9	3584		8-9	3584
Arsenic	110	0-1	3631	--	--	--
Cadmium	33	3-4	3583	--	--	--
Chromium	5200	8-9	3584	--	--	--
Copper	28000	8-9	3584	--	--	--
Lead	7100	2-2.5	3086	--	--	--
Mercury	>4.0	3.5-4.5	3598	--	--	--
Zinc	12000	2-2.5	3086	--	--	--

1/ PPDDE 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
2/ PPDDT 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
3/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.
4/ Suspected laboratory contaminant.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-1c-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1c

AVERAGE SITE DEPTH TO GROUNDWATER: 28 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,1-TRICHLOROETHANE	1.1	36180	05/9/88
1,1,2-TRICHLOROETHANE	62	36090	02/8/88
1,1-DICHLOROETHYLENE	67	36185	01/25/89
1,2-DICHLOROETHYLENE	36	36090	02/8/88
1,2-DICHLOROETHANE	370	36090	02/9/88
M-XYLENE	5.0	36180	01/6/89
ALDRIN	3.4	36180	01/6/89
ATRAZINE	25	36180	01/6/89
BICYCLOHEPTADIENE	12	36180	01/6/89
BENZOTHIAZOLE	29	36090	01/9/89
BENZENE	360	36185	01/25/89
CARBON TETRACHLORIDE	3.8	36180	01/6/89
METHYLENE CHLORIDE	120	36185	01/25/89
CHLOROFORM	26	36180	01/6/89
CHLOROBENZENE	1700	36180	01/6/89
CHLORDANE	9.9	36180	01/6/89
CHLOROPHENYLMETHYL SULFIDE	19	36180	10/7/87

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

TABLE CSA-1c-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1c

AVERAGE SITE DEPTH TO GROUNDWATER: 28 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
CHLOROPHENYLMETHYL SULFONE	14	36180	05/9/88
DIBROMOCHLOROPROPANE	190	36080	02/11/88
DIISOPROPYLMETHYL PHOSPHONATE	7000	36180	10/7/87
DITHIANE	2100	36180	01/6/89
DIELDRIN	0.23	36180	01/6/89
DIMETHYLMETHYL PHOSPHONATE	260	36090	01/9/89
ENDRIN	0.17	36180	01/6/89
ETHYLBENZENE	6.3	36090	01/9/89
ISODRIN	0.76	36180	01/6/89
TOLUENE	170	36180	01/6/89
MALATHION	14	36180	01/6/89
1,4-OXATHIANE	1100	36090	02/8/88
PPDDE	0.23	36180	01/6/89
PPDDT	0.34	36180	01/6/89
SUPONA	0.97	36180	01/6/89
TETRACHLOROETHYLENE	2900	36185	01/25/89
TRICHLOROETHYLENE	200	36090	02/8/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

TABLE CSA-1c-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1c

AVERAGE SITE DEPTH TO GROUNDWATER: 28 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
O,P-XYLENE	14	36180	01/6/89

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.0E+06	1.5E+00	6.7E+02*	3.4E-02a	6.7E+02*	0.0E+00
ATRAZINE	4.1E+04	0.0E+00	4.1E+04	0.0E+00	0.0E+00	0.0E+00	5.3E-13
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-03
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	7.5E-08
BICYCLOHEPTADIENE	3.2E+05	0.0E+00	3.2E+05	0.0E+00	0.0E+00	0.0E+00	6.0E-07
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	4.0E-04
CHLORDANE	2.0E+01	3.2E+06	2.0E+01	3.6E+00*	2.2E-05	3.6E+00*	2.3E-06
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	8.7E-05
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.4E-05
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-08
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	3.5E-10
PPDDE	7.4E+01	1.8E+06	7.4E+01	4.1E-02	1.7E-06	4.1E-02	1.1E-07
PPDDT	7.4E+01	3.8E+06	7.4E+01	3.1E-04	6.0E-09	3.1E-04	1.1E-06
DIBROMOCHLOROPROPANE	1.8E+01	2.0E+01	9.5E+00	7.8E-03	7.0E-03	1.5E-02	2.4E-03
1,2-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.3E-03
1,1-DICHLOROETHYLENE	4.3E+01	0.0E+00	4.3E+01	0.0E+00	0.0E+00	0.0E+00	9.3E-02
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	3.2E+02*	3.7E-02a	3.2E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	3.8E+05	2.4E+05	1.5E-05	2.6E-05	4.1E-05	9.8E-07
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	3.6E-03	0.0E+00	3.6E-03	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	6.5E-04	1.5E-07a	6.5E-04	0.0E+00
ETHYLBENZENE	8.3E+05	0.0E+00	8.3E+05	0.0E+00	0.0E+00	0.0E+00	2.7E-08
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	3.1E-01*	0.0E+00	3.1E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	2.6E+04	1.0E+04	0.0E+00	3.8E-04	3.8E-04	0.0E+00
ISODRIN	5.8E+02	2.2E+06	5.8E+02	8.6E-04	9.3E-07	8.7E-04	1.6E-07
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+06	0.0E+00	2.5E+06	7.3E-06	0.0E+00	7.3E-06	0.0E+00
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	3.8E-12
METHYLENE CHLORIDE	3.3E+03	0.0E+00	3.3E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-04
1,4-OXATHIANE	2.5E+05	0.0E+00	2.5E+05	2.0E-06	0.0E+00	2.0E-06	0.0E+00
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.1E-13
1,1,2,2-TETRACHLOROETHANE	1.3E+02	2.1E+02	7.9E+01	4.7E+00*	2.9E+00*	7.6E+00*	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.0E+06	4.9E+02	2.0E+00*	7.0E-02a	2.0E+00*	0.0E+00
TOLUENE	2.5E+06	2.9E+06	1.3E+06	8.0E-07	7.0E-07	1.5E-06	1.6E-07
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	4.1E-09
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.5E-04
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-03
M-XYLENE	1.4E+07	0.0E+00	1.4E+07	0.0E+00	0.0E+00	0.0E+00	2.9E-08
O,P-XYLENE	1.4E+07	2.2E+06	1.9E+06	1.4E-07	9.1E-07	1.1E-06	8.1E-08
ARSENIC	2.2E+01	0.0E+00	2.2E+01	5.1E+00*	0.0E+00	5.1E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.3E-02	0.0E+00	7.3E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	7.5E+01*	0.0E+00	7.5E+01*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	6.7E-02	0.0E+00	6.7E-02	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.6E-01*	0.0E+00	4.6E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.2E-03	0.0E+00	1.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.0E-03	0.0E+00	6.0E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1c-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.0E+06	1.5E+00	6.7E+02*	3.4E-02a	6.7E+02*	0.0E+00
ATRAZINE	4.1E+04	0.0E+00	4.1E+04	0.0E+00	0.0E+00	0.0E+00	5.3E-13
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-03
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	7.5E-08
BICYCLOHEPTADIENE	3.2E+05	0.0E+00	3.2E+05	0.0E+00	0.0E+00	0.0E+00	6.0E-07
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	4.0E-04
CHLORDANE	2.0E+01	3.2E+06	2.0E+01	3.6E+00*	2.2E-05	3.6E+00*	2.3E-06
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	8.7E-05
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.4E-05
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-08
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	3.5E-10
PPDDE	7.4E+01	1.8E+06	7.4E+01	4.1E-02	1.7E-06	4.1E-02	1.1E-07
PPDDT .	7.4E+01	3.8E+06	7.4E+01	3.1E-04	6.0E-09	3.1E-04	1.1E-06
DIBROMOCHLOROPROPANE	1.8E+01	2.0E+01	9.5E+00	7.8E-03	7.0E-03	1.5E-02	2.4E-03
1,2-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.3E-03
1,1-DICHLOROETHYLENE	4.3E+01	0.0E+00	4.3E+01	0.0E+00	0.0E+00	0.0E+00	9.3E-02
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	3.2E+02*	3.7E-02a	3.2E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	3.8E+05	2.4E+05	1.5E-05	2.6E-05	4.1E-05	9.8E-07
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	3.6E-03	0.0E+00	3.6E-03	0.0E+00
ENDRIN	2.5E+03	1.0E+06	2.5E+03	6.5E-04	1.5E-07a	6.5E-04	0.0E+00
ETHYLBENZENE	8.3E+05	0.0E+00	8.3E+05	0.0E+00	0.0E+00	0.0E+00	2.7E-08
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	3.1E-01*	0.0E+00	3.1E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	1.7E+04	2.6E+04	1.0E+04	0.0E+00	3.8E-04	3.8E-04	0.0E+00
ISODRIN	5.8E+02	2.2E+06	5.8E+02	8.6E-04	9.3E-07	8.7E-04	1.6E-07
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+06	0.0E+00	2.5E+06	7.3E-06	0.0E+00	7.3E-06	0.0E+00
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	3.8E-12
METHYLENE CHLORIDE	3.3E+03	0.0E+00	3.3E+03	0.0E+00	0.0E+00	0.0E+00	1.5E-04
1,4-OXATHIANE	2.5E+05	0.0E+00	2.5E+05	2.0E-06	0.0E+00	2.0E-06	0.0E+00
SUPONA	1.2E+03	0.0E+00	1.2E+03	0.0E+00	0.0E+00	0.0E+00	2.1E-13
1,1,2,2-TETRACHLOROETHANE	1.3E+02	2.1E+02	7.9E+01	4.7E+00*	2.9E+00*	7.6E+00*	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	1.0E+06	4.9E+02	2.0E+00*	7.0E-02a	2.0E+00*	0.0E+00
TOLUENE	2.5E+06	2.9E+06	1.3E+06	8.0E-07	7.0E-07	1.5E-06	1.6E-07
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	4.1E-09
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.5E-04
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.1E-03
M-XYLENE	1.4E+07	0.0E+00	1.4E+07	0.0E+00	0.0E+00	0.0E+00	2.9E-08
O,P-XYLENE	1.4E+07	2.2E+06	1.9E+06	1.4E-07	9.1E-07	1.1E-06	8.1E-08
ARSENIC	2.2E+01	0.0E+00	2.2E+01	5.1E+00*	0.0E+00	5.1E+00*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.3E-02	0.0E+00	7.3E-02	0.0E+00
CHROMIUM	6.9E+01	0.0E+00	6.9E+01	7.5E+01*	0.0E+00	7.5E+01*	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	6.7E-02	0.0E+00	6.7E-02	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	4.6E-01*	0.0E+00	4.6E-01*	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.2E-03	0.0E+00	1.2E-03	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	6.0E-03	0.0E+00	6.0E-03	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1c-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	2.0E+03	2.1E-01	4.8E+03*	5.1E-01*	4.8E+03*	0.0E+00
ATRAZINE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-12
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	3.3E-02
BENZOTHIAZOLE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	4.9E-07
BICYCLOHEPTADIENE	1.4E+05	0.0E+00	1.4E+05	0.0E+00	0.0E+00	0.0E+00	3.9E-06
CARBON TETRACHLORIDE	2.7E+01	0.0E+00	2.7E+01	0.0E+00	0.0E+00	0.0E+00	6.0E-03
CHLORDANE	2.7E+00	2.1E+05	2.7E+00	2.6E+01*	3.3E-04	2.6E+01*	3.4E-05
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	5.6E-04
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	3.6E-04
CHLOROPHENYLMETHYL SULFIDE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.6E-07
CHLOROPHENYLMETHYL SULFONE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.3E-09
PPDDE	1.0E+01	1.2E+05	1.0E+01	2.9E-01*	2.5E-05	2.9E-01*	1.6E-06
PPDDT	1.0E+01	2.5E+05	1.0E+01	2.3E-03	9.1E-08	2.3E-03	1.7E-05
DIBROMOCHLOROPROPANE	2.5E+00	3.1E+00	1.4E+00	5.6E-02	4.5E-02	1.0E-01*	3.6E-02
1,2-DICHLOROETHANE	3.9E+01	0.0E+00	3.9E+01	0.0E+00	0.0E+00	0.0E+00	1.9E-02
1,1-DICHLOROETHYLENE	5.9E+00	0.0E+00	5.9E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+00
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIELDRIN	2.2E-01	9.0E+02	2.2E-01	2.3E+03*	5.5E-01*	2.3E+03*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	1.4E+05	9.2E+04	3.6E-05	7.3E-05	1.1E-04	6.4E-06
DIMETHYMETHYL PHOSPHONATE	6.3E+04	0.0E+00	6.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	3.5E+04	0.0E+00	3.5E+04	8.5E-03	0.0E+00	8.5E-03	0.0E+00
ENDRIN	1.1E+03	1.0E+06	1.1E+03	1.5E-03	9.4E-07a	1.5E-03	0.0E+00
ETHYLBENZENE	3.5E+05	0.0E+00	3.5E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-07
FLUOROACETIC ACID	1.7E+01	0.0E+00	1.7E+01	7.3E-01*	0.0E+00	7.3E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.7E+03	8.2E+01	8.1E+01	0.0E+00	1.2E-01*	1.2E-01*	0.0E+00
ISODRIN	2.5E+02	3.3E+05	2.5E+02	2.0E-03	6.0E-06	2.0E-03	1.0E-06
ISOPROPYL METHYL PHOSPHONIC ACID	1.1E+06	0.0E+00	1.1E+06	1.7E-05	0.0E+00	1.7E-05	0.0E+00
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.5E-11
METHYLENE CHLORIDE	4.5E+02	0.0E+00	4.5E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-03
1,4-OXATHIANE	1.1E+05	0.0E+00	1.1E+05	4.7E-06	0.0E+00	4.7E-06	0.0E+00
SUPONA	5.3E+02	0.0E+00	5.3E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-12
1,1,2,2-TETRACHLOROETHANE	1.8E+01	1.4E+01	7.7E+00	3.4E+01*	4.4E+01*	7.8E+01*	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	2.2E+03	6.9E+01	1.4E+01*	4.5E-01*	1.5E+01*	0.0E+00
TOLUENE	1.1E+06	1.0E+06	5.2E+05	1.9E-06	1.9E-06	3.8E-06	1.0E-06
1,1,1-TRICHLOROETHANE	3.2E+05	0.0E+00	3.2E+05	0.0E+00	0.0E+00	0.0E+00	2.6E-08
1,1,2-TRICHLOROETHANE	6.0E+01	0.0E+00	6.0E+01	0.0E+00	0.0E+00	0.0E+00	2.3E-03
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-02
M-XYLENE	5.8E+06	0.0E+00	5.8E+06	0.0E+00	0.0E+00	0.0E+00	1.9E-07
O,P-XYLENE	5.8E+06	7.9E+05	7.0E+05	3.4E-07	2.5E-06	2.9E-06	5.2E-07
ARSENIC	3.9E+00	0.0E+00	3.9E+00	2.8E+01*	0.0E+00	2.8E+01*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	5.7E-01*	0.0E+00	5.7E-01*	0.0E+00
CHROMIUM	8.8E+00	0.0E+00	8.8E+00	5.9E+02*	0.0E+00	5.9E+02*	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	1.1E-01*	0.0E+00	1.1E-01*	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	7.7E-01*	0.0E+00	7.7E-01*	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	2.0E-03	0.0E+00	2.0E-03	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.1E-02	0.0E+00	1.1E-02	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway consicered, even in its pure form.

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	5.3E+02*	7.9E+00*	5.4E+02*	0.0E+00
ATRAZINE	2.3E+04	0.0E+00	2.3E+04	0.0E+00	0.0E+00	0.0E+00	6.3E-10
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	8.8E-01
BENZOTHIAZOLE	2.2E+04	0.0E+00	2.2E+04	0.0E+00	0.0E+00	0.0E+00	9.0E-05
BICYCLOHEPTADIENE	1.8E+05	0.0E+00	1.8E+05	0.0E+00	0.0E+00	0.0E+00	7.2E-04
CARBON TETRACHLORIDE	2.5E+02	0.0E+00	2.5E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-01
CHLORDANE	2.5E+01	1.4E+04	2.5E+01	2.8E+00*	5.2E-03	2.8E+00*	9.0E-04
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	1.0E-01
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	9.5E-03
CHLOROPHENYLMETHYL SULFIDE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	4.8E-05
CHLOROPHENYLMETHYL SULFONE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	4.2E-07
PPDDE	9.3E+01	1.9E+01	1.6E+01	3.2E-02	1.5E-01*	1.9E-01*	4.4E-05
PPDDT	9.3E+01	1.9E+01	1.6E+01	2.5E-04	1.2E-03	1.4E-03	4.6E-04
DIBROMOCHLOROPROPANE	2.3E+01	4.8E+00	3.9E+00	6.1E-03	2.9E-02	3.6E-02	9.6E-01
1,2-DICHLOROETHANE	3.5E+02	0.0E+00	3.5E+02	0.0E+00	0.0E+00	0.0E+00	5.0E-01
1,1-DICHLOROETHYLENE	5.4E+01	0.0E+00	5.4E+01	0.0E+00	0.0E+00	0.0E+00	3.7E+01
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	2.5E+02*	8.7E+00*	2.6E+02*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	3.3E+02	3.3E+02	2.7E-05	3.0E-02	3.0E-02	1.2E-03
DIMETHYMETHYL PHOSPHONATE	8.2E+04	0.0E+00	8.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	4.6E+04	0.0E+00	4.6E+04	6.5E-03	0.0E+00	6.5E-03	0.0E+00
ENDRIN	1.4E+03	1.0E+06	1.3E+03	1.2E-03	1.0E-04a	1.3E-03	0.0E+00
ETHYLBENZENE	4.6E+05	0.0E+00	4.6E+05	0.0E+00	0.0E+00	0.0E+00	3.2E-05
FLUOROACETIC ACID	2.2E+01	0.0E+00	2.2E+01	5.6E-01*	0.0E+00	5.6E-01*	0.0E+00
HEXACHLOROCYCLOPENTADIENE	5.5E+03	2.6E+01	2.6E+01	0.0E+00	3.9E-01*	3.9E-01*	0.0E+00
ISODRIN	3.2E+02	3.0E+03	2.9E+02	1.6E-03	6.6E-04	2.2E-03	1.9E-04
ISOPROPYL METHYL PHOSPHONIC ACID	1.4E+06	0.0E+00	1.4E+06	1.3E-05	0.0E+00	1.3E-05	0.0E+00
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	4.5E-09
METHYLENE CHLORIDE	4.1E+03	0.0E+00	4.1E+03	0.0E+00	0.0E+00	0.0E+00	5.9E-02
1,4-OXATHIANE	1.4E+05	0.0E+00	1.4E+05	3.6E-06	0.0E+00	3.6E-06	0.0E+00
SUPONA	6.9E+02	0.0E+00	6.9E+02	0.0E+00	0.0E+00	0.0E+00	2.6E-10
1,1,2,2-TETRACHLOROETHANE	1.6E+02	8.7E-01	8.7E-01	3.7E+00*	6.9E+02*	6.9E+02*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	2.2E+02	1.7E+02	1.5E+00*	4.5E+00*	6.0E+00*	0.0E+00
TOLUENE	1.4E+06	2.1E+03	2.1E+03	1.4E-06	9.5E-04	9.5E-04	1.9E-04
1,1,1-TRICHLOROETHANE	4.2E+05	0.0E+00	4.2E+05	0.0E+00	0.0E+00	0.0E+00	4.9E-06
1,1,2-TRICHLOROETHANE	5.5E+02	0.0E+00	5.5E+02	0.0E+00	0.0E+00	0.0E+00	6.0E-02
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	4.2E-01
M-XYLENE	7.0E+06	0.0E+00	7.0E+06	0.0E+00	0.0E+00	0.0E+00	3.5E-05
O,P-XYLENE	7.0E+06	1.0E+03	1.0E+03	2.9E-07	1.9E-03	1.9E-03	9.7E-05
ARSENIC	2.0E+01	0.0E+00	2.0E+01	5.5E+00*	0.0E+00	5.5E+00*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	9.2E-02	0.0E+00	9.2E-02	0.0E+00
CHROMIUM	5.5E+01	0.0E+00	5.5E+01	9.5E+01*	0.0E+00	9.5E+01*	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	1.6E-01*	0.0E+00	1.6E-01*	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	1.1E+00*	0.0E+00	1.1E+00*	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	2.9E-03	0.0E+00	2.9E-03	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.5E-02	0.0E+00	1.5E-02	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	4.0E+03	4.2E+01	1.2E-01	8.6E+03*	2.4E+01*	8.6E+03*	0.0E+00	0.0E+00
ATRAZINE	4.2E+03	0.0E+00	0.0E+00	4.2E+03	0.0E+00	0.0E+00	0.0E+00	3.9E-12	6.3E-10
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	1.7E-02	2.6E+00
BENZOTHIAZOLE	4.0E+03	0.0E+00	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	5.7E-07	9.0E-05
BICYCLOHEPTADIENE	3.3E+04	0.0E+00	0.0E+00	3.3E+04	0.0E+00	0.0E+00	0.0E+00	4.5E-06	7.2E-04
CARBON TETRACHLORIDE	1.5E+01	0.0E+00	0.0E+00	1.5E+01	0.0E+00	0.0E+00	0.0E+00	3.0E-03	4.8E-01
CHLORDANE	1.5E+00	4.3E+05	4.5E+03	1.5E+00	4.6E+01*	1.6E-02	4.6E+01*	1.7E-05	2.7E-03
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	6.5E-04	1.0E-01
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-04	2.8E-02
CHLOROPHENYLMETHYL SULFIDE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.0E-07	4.8E-05
CHLOROPHENYLMETHYL SULFONE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.6E-09	4.2E-07
PPDDE	5.7E+00	2.4E+05	1.9E+01	4.4E+00	5.2E-01*	1.5E-01*	6.8E-01*	8.2E-07	1.3E-04
PPDDT	5.7E+00	5.1E+05	1.9E+01	4.4E+00	4.0E-03	1.2E-03	5.2E-03	8.6E-06	1.4E-03
DIBROMOCHLOROPROPANE	1.4E+00	2.7E+00	4.8E+00	7.7E-01	1.0E-01	8.2E-02	1.8E-01*	1.8E-02	2.9E+00
1,2-DICHLOROETHANE	2.2E+01	0.0E+00	0.0E+00	2.2E+01	0.0E+00	0.0E+00	0.0E+00	9.4E-03	1.5E+00
1,1-DICHLOROETHYLENE	3.2E+00	0.0E+00	0.0E+00	3.2E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-01	1.1E+02
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	1.8E+03	1.9E+01	1.2E-01	4.1E+03*	2.6E+01*	4.1E+03*	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	5.1E+04	1.0E+03	9.7E+02	1.5E-04	1.0E-02	1.0E-02	7.4E-06	1.2E-03
DIMETHYMETHYL PHOSPHONATE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	8.5E+03	0.0E+00	0.0E+00	8.5E+03	3.5E-02	0.0E+00	3.5E-02	0.0E+00	0.0E+00
ENDRIN	2.5E+02	1.0E+06	1.0E+06	2.5E+02	6.3E-03	1.0E-04a	6.4E-03	0.0E+00	0.0E+00
ETHYLBENZENE	8.5E+04	0.0E+00	0.0E+00	8.5E+04	0.0E+00	0.0E+00	0.0E+00	2.0E-07	3.2E-05
FLUOROACETIC ACID	4.0E+00	0.0E+00	0.0E+00	4.0E+00	3.0E+00*	0.0E+00	3.0E+00*	0.0E+00	0.0E+00
HEXACHLOROCYCLOPENTADIENE	3.8E+02	3.5E+03	2.6E+01	2.4E+01	0.0E+00	3.9E-01*	3.9E-01*	0.0E+00	0.0E+00
ISODRIN	5.9E+01	2.9E+05	3.0E+03	5.8E+01	8.4E-03	6.7E-04	9.1E-03	1.2E-06	1.9E-04
ISOPROPYL METHYL PHOSPHONIC ACID	2.5E+05	0.0E+00	0.0E+00	2.5E+05	7.1E-05	0.0E+00	7.1E-05	0.0E+00	0.0E+00
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.8E-11	4.5E-09
METHYLENE CHLORIDE	2.5E+02	0.0E+00	0.0E+00	2.5E+02	0.0E+00	0.0E+00	0.0E+00	1.1E-03	1.8E-01
1,4-OXATHIANE	2.5E+04	0.0E+00	0.0E+00	2.5E+04	2.0E-05	0.0E+00	2.0E-05	0.0E+00	0.0E+00
SUPONA	1.3E+02	0.0E+00	0.0E+00	1.3E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-12	2.6E-10
1,1,2,2-TETRACHLOROETHANE	9.9E+00	2.7E+01	2.8E-01	2.7E-01	6.1E+01*	2.1E+03*	2.2E+03*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	1.9E+03	2.2E+02	3.4E+01	2.4E+01*	5.0E+00*	2.9E+01*	0.0E+00	0.0E+00
TOLUENE	2.6E+05	3.8E+05	6.3E+03	6.1E+03	7.7E-06	3.2E-04	3.3E-04	1.2E-06	1.9E-04
1,1,1-TRICHLOROETHANE	7.8E+04	0.0E+00	0.0E+00	7.8E+04	0.0E+00	0.0E+00	0.0E+00	3.1E-08	4.9E-06
1,1,2-TRICHLOROETHANE	3.4E+01	0.0E+00	0.0E+00	3.4E+01	0.0E+00	0.0E+00	0.0E+00	1.1E-03	1.8E-01
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	8.0E-03	1.3E+00
M-XYLENE	8.8E+05	0.0E+00	0.0E+00	8.8E+05	0.0E+00	0.0E+00	0.0E+00	2.2E-07	3.5E-05
O,P-XYLENE	8.8E+05	2.9E+05	3.1E+03	3.0E+03	2.3E-06	6.5E-04	6.6E-04	6.1E-07	9.7E-05
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	6.8E+01*	0.0E+00	6.8E+01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	4.3E+00*	0.0E+00	4.3E+00*	0.0E+00	0.0E+00
CHROMIUM	1.1E+00	0.0E+00	0.0E+00	1.1E+00	4.5E+03*	0.0E+00	4.5E+03*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	4.9E-01*	0.0E+00	4.9E-01*	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.2E+00*	0.0E+00	3.2E+00*	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	8.7E-03	0.0E+00	8.7E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	8.6E-02	0.0E+00	8.6E-02	0.0E+00	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

2.4 SITE CSA-1d: SANITARY LANDFILL AND INCINERATOR 834 (formerly Site 36-7: Soild Waste Burial/Sanitary Pits; ESE, 1988f/RIC 88063R07 and ESE, 1988g/RIC 88063R07A)

2.4.1 Site-Specific Considerations

Figure CSA-1d-1 and Tables CSA-1d-1 and CSA-1d-2 depict the target contaminants for Site CSA-1d. Borings 3105 through 3117 and 3683 through 3712 were included in the exposure assessment, consistent with the Central SAR. According to site history, no chemicals from the RMA target contaminant list other than benzene and supona were specifically suspected to be present in Site CSA-1d (ESE, 1988f/RIC 88063R07). However, several nontarget compounds were suspected to have been disposed at the site.

2.4.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-1d are shown in Figure CSA-1d-1. Toluene, occurring in Borings 3106 (4-5 ft), 3107 (4-5 ft), and 3112 (8-9 ft) was not included in the figure because it was detected in the nontarget analysis, but it is still considered a target contaminant for this exposure assessment (see Appendix A). Pyrene, occurring in Boring 3689 (3-4 ft), was not included in the figure, since it was not considered a target contaminant during the Phase I and Phase II investigations. Although not shown in this figure, pyrene was included in the Central SAR and in this exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988a/RIC 88357R01).

Table CSA-1d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-1d-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.4.3 Site Exposure Summary

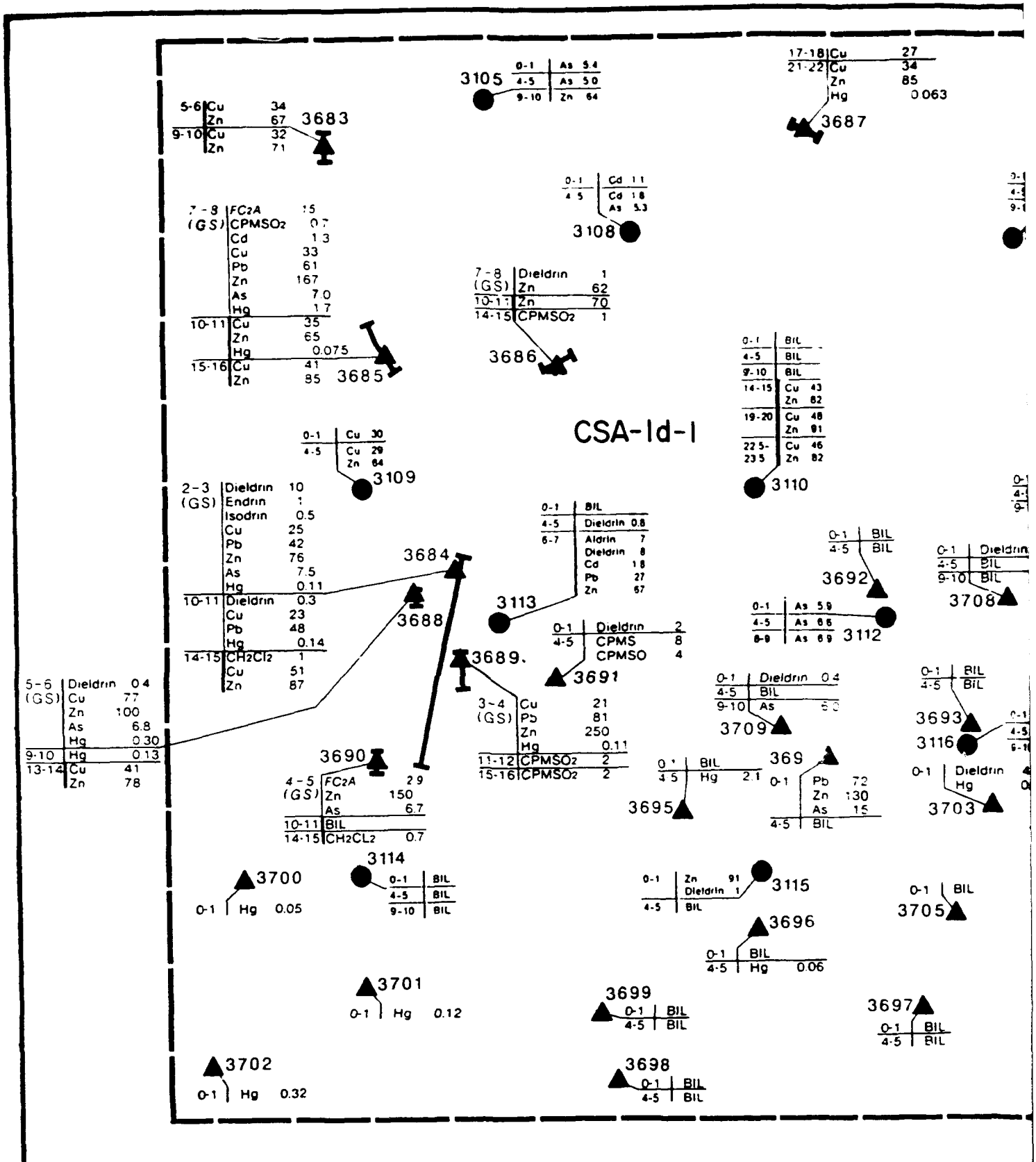
Tables CSA-1d-3 through CSA-1d-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-1d is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

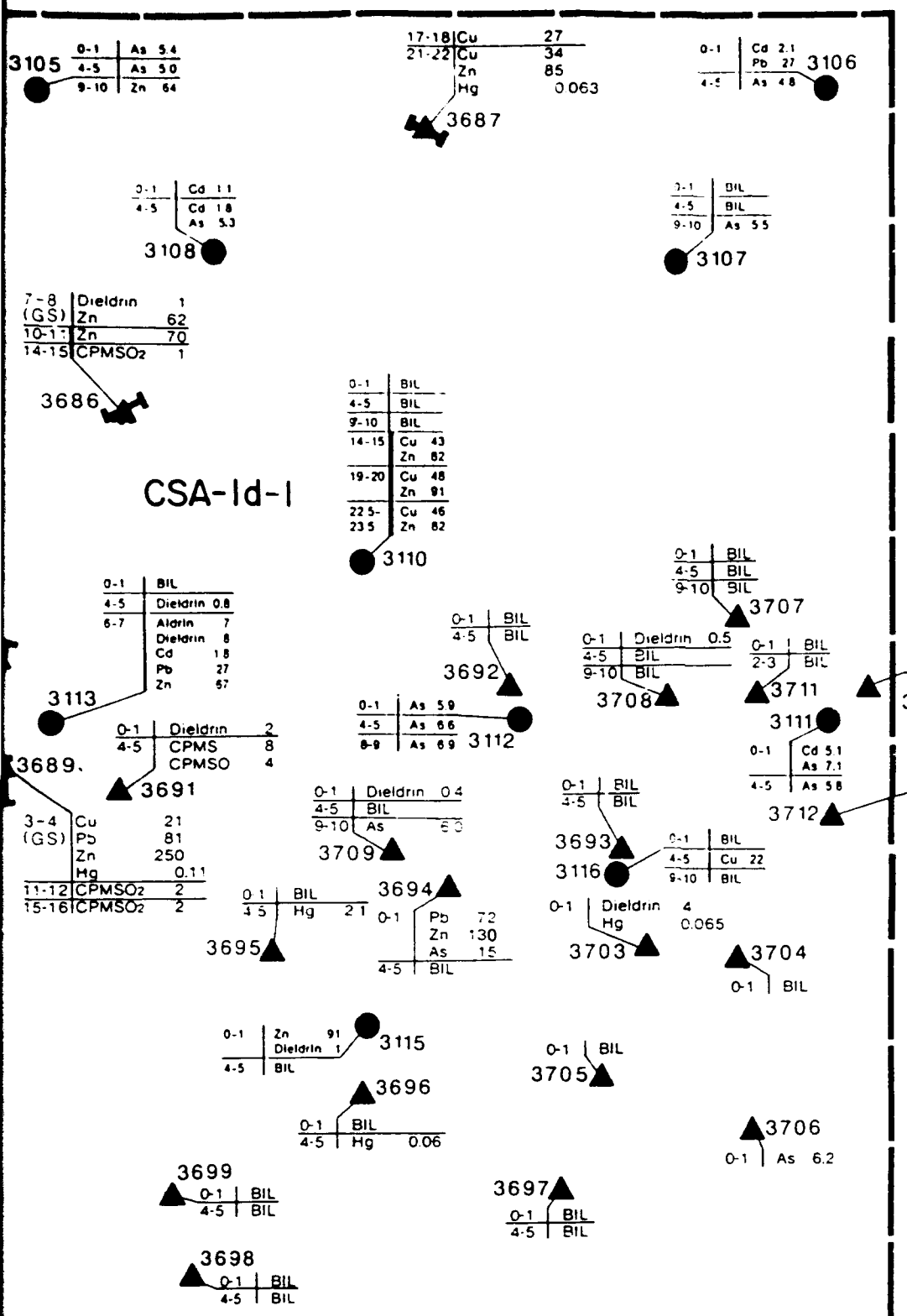
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Aldrin	Direct	Direct	Direct	Direct	Dir/Ind
Dieldrin	Direct	Direct	Direct	Dir/Ind	Dir/Ind
Fluoroacetic acid	Direct	Direct	Direct	Direct	Direct
Arsenic	Direct	Direct	Direct	Direct	Direct
Methylene chloride	--	--	--	Indirect	Indirect
Cadmium	--	--	--	--	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site CSA-1d is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicatecd by VEI values less than 1.

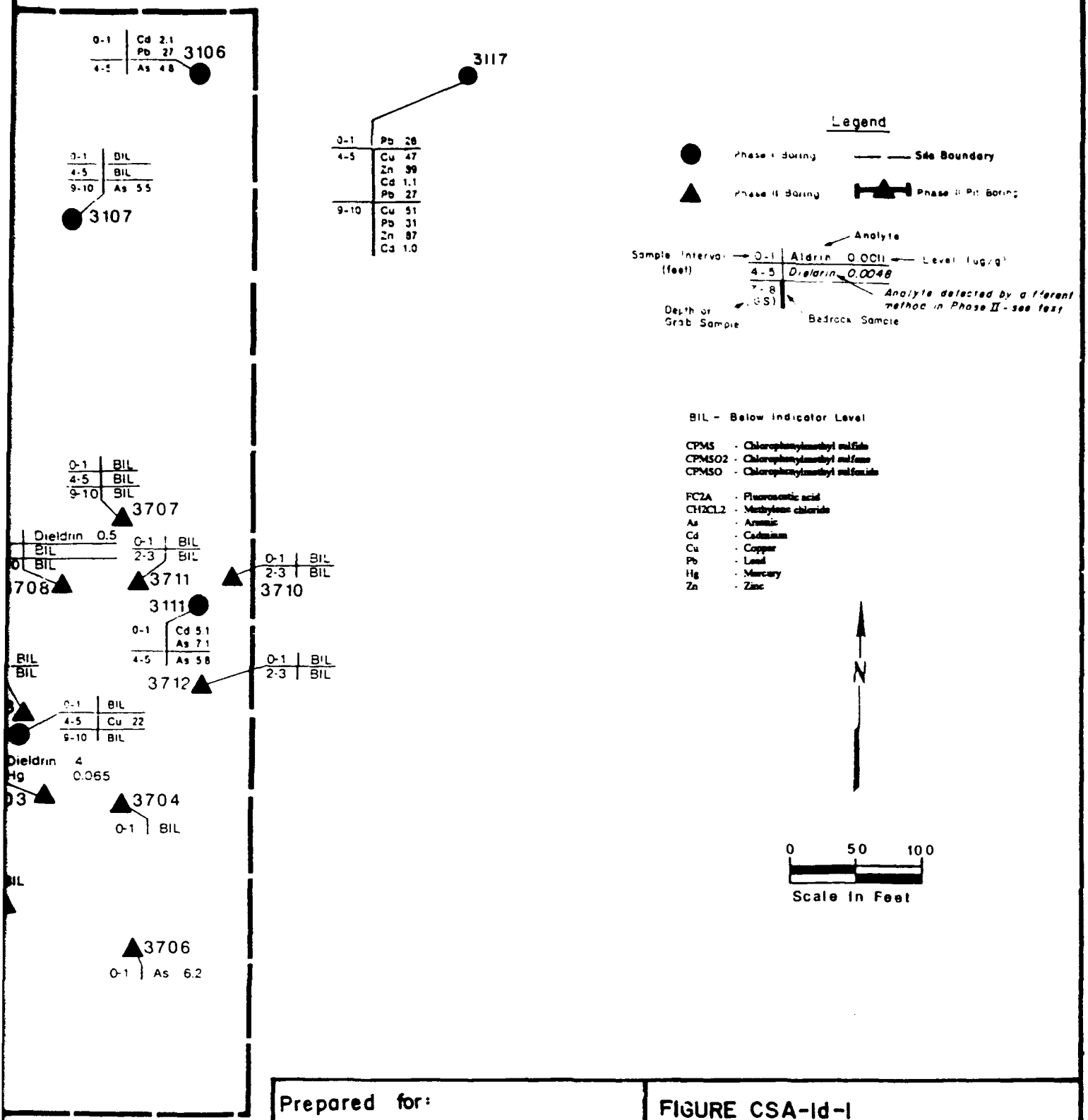

CSA-Id-1
3105
0-1 As 5.4
4-5 As 5.0
9-10 Zn 64
17-18 Cu 27
21-22 Cu 34
Zn 85
Hg 0.063
3687
5-6 Cu 34
Zn 67
9-10 Cu 32
Zn 71
3683
0-1 Cd 1.1
4-5 Cd 1.8
As 5.3
3108
7-8 (GS) FC2A 15
CPMSO2 0.7
Cd 1.3
Cu 33
Pb 61
Zn 167
As 7.0
Hg 1.7
10-11 Cu 35
Zn 65
Hg 0.075
15-16 Cu 41
Zn 85
3685
7-8 (GS) Dieldrin 1
Zn 62
10-11 Zn 70
14-15 CPMSO2 1
3686
0-1 BIL
4-5 BIL
9-10 BIL
14-15 Cu 43
Zn 82
19-20 Cu 48
Zn 91
22.5-23.5 Cu 46
Zn 82
3110
0-1 Cu 30
4-5 Cu 29
Zn 64
3109
2-3 (GS) Dieldrin 10
Endrin 1
Isodrin 0.5
Cu 25
Pb 42
Zn 76
As 7.5
Hg 0.11
10-11 Dieldrin 0.3
Cu 23
Pb 48
Hg 0.14
14-15 CH2Cl2 1
Cu 51
Zn 87
3684
3688
0-1 BIL
4-5 Dieldrin 0.8
6-7 Aldrin 7
Dieldrin 8
Cd 1.8
Pb 27
Zn 67
3113
0-1 BIL
4-5 BIL
3692
0-1 Dieldrin
4-5 BIL
9-10 BIL
3708
0-1 As 5.9
4-5 As 8.8
8-9 As 6.9
3112
0-1 Dieldrin 2
4-5 CPMS 8
CPMSO 4
3691
3689
5-6 (GS) Dieldrin 0.4
Cu 77
Zn 100
As 6.8
Hg 0.30
9-10 Hg 0.13
13-14 Cu 41
Zn 78
3-4 (GS) Cu 21
Pb 81
Zn 250
Hg 0.11
11-12 CPMSO2 2
15-16 CPMSO2 2
0-1 Dieldrin 0.4
4-5 BIL
9-10 As 5.0
3709
0-1 BIL
4-5 BIL
3693
3116
0-1 Dieldrin
Hg
3703
3690
4-5 (GS) FC2A 2.9
Zn 150
As 6.7
10-11 BIL
14-15 CH2CL2 0.7
0-1 BIL
4-5 Hg 2.1
3695
369
0-1 Pb 72
Zn 130
As 15
4-5 BIL
3114
0-1 BIL
4-5 BIL
9-10 BIL
3700
0-1 Hg 0.05
0-1 Zn 91
Dieldrin 1
4-5 BIL
3115
0-1 BIL
3705
3696
0-1 BIL
4-5 Hg 0.06
3701
0-1 Hg 0.12
3699
0-1 BIL
4-5 BIL
3697
0-1 BIL
4-5 BIL
3702
0-1 Hg 0.32
3698
0-1 BIL
4-5 BIL



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

Source: HLA, 1988 Revised: 4/10/89



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

Source: HLA, 1988 Revised: 4/10/89

FIGURE CSA-Id-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels
Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE CSA-1d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-1d

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	7	6-7	3113	7	6-7	3113
Chlorophenylmethyl sulfide	8	4-5	3691	8	4-5	3691
Chlorophenylmethyl sulfone	0.7	7-8	3685	2	11-12	3689
	--	--	--		15-16	3689
Chlorophenylmethyl sulfoxide	4	4-5	3691	4	4-5	3691
Dieldrin	10	2-3	3684	10	2-3	3684
Endrin	1	2-3	3684	1	2-3	3684
Fluoroacetic acid	15	7-8	3685	15	7-8	3685
Isodrin	0.5	2-3	3684	0.5	2-3	3684
Methylene chloride	--	--	--	1	14-15	3684
Pyrene[1/]	2.0	3-4	3689	2.0	3-4	3689
Toluene	0.30	8-9	3112	0.30	8-9	3112
Arsenic	15	0-1	3694	--	--	--
Cadmium	5.1	0-1	3111	--	--	--
Copper	77	5-6	3688	--	--	--
Lead	81	3-4	3689	--	--	--
Mercury	2.1	4-5	3695	--	--	--
Zinc	250	3-4	3689	--	--	--

1/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-1d-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-1d

AVERAGE SITE DEPTH TO GROUNDWATER: 34 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,1-TRICHLOROETHANE	3.1	36146	05/10/88
CHLOROFORM	2.1	36146	01/3/89
DIISOPROPYLMETHYL PHOSPHONATE	0.91	36146	01/3/89
DITHIANE	6.8	36146	01/3/89
TETRACHLOROETHYLENE	2.1	36146	05/10/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-1d-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.9E+06	1.5E+00	4.7E+00*	3.7E-06	4.7E+00*	0.0E+00
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	3.1E+06	1.6E+05	4.9E-05	2.6E-06	5.1E-05	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.6E+05	6.4E+05	1.3E+05	4.3E-06	3.1E-06	7.4E-06	0.0E+00
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	6.2E+05	1.3E+05	2.4E-05	6.4E-06	3.1E-05	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	6.4E+00*	5.5E-04a	6.4E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	7.9E-11
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	1.5E+07	2.5E+03	4.0E-04	6.8E-08	4.0E-04	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	3.9E-01*	0.0E+00	3.9E-01*	0.0E+00
ISODRIN	5.8E+02	2.9E+06	5.8E+02	8.6E-04	1.7E-07	8.6E-04	0.0E+00
METHYLENE CHLORIDE	3.3E+03	5.6E+03	2.1E+03	0.0E+00	1.8E-04	1.8E-04	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	3.5E-06
TOLUENE	2.5E+06	4.2E+06	1.6E+06	1.2E-07	7.2E-08	1.9E-07	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	7.0E-09
ARSENIC	2.2E+01	0.0E+00	2.2E+01	6.9E-01*	0.0E+00	6.9E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.1E-02	0.0E+00	1.1E-02	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.8E-04	0.0E+00	1.8E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.2E-03	0.0E+00	5.2E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	6.3E-04	0.0E+00	6.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.3E-04	0.0E+00	1.3E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1d-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	1.9E+06	1.5E+00	4.7E+00*	3.7E-06	4.7E+00*	0.0E+00
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	1.2E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	3.1E+06	1.6E+05	4.9E-05	2.6E-06	5.1E-05	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.6E+05	6.4E+05	1.3E+05	4.3E-06	3.1E-06	7.4E-06	0.0E+00
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	6.2E+05	1.3E+05	2.4E-05	6.4E-06	3.1E-05	0.0E+00
DIELDRIN	1.6E+00	1.0E+06	1.6E+00	6.4E+00*	5.5E-04a	6.4E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	7.9E-11
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	1.5E+07	2.5E+03	4.0E-04	6.8E-08	4.0E-04	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	3.9E-01*	0.0E+00	3.9E-01*	0.0E+00
ISODRIN	5.8E+02	2.9E+06	5.8E+02	8.6E-04	1.7E-07	8.6E-04	0.0E+00
METHYLENE CHLORIDE	3.3E+03	5.6E+03	2.1E+03	0.0E+00	1.8E-04	1.8E-04	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	3.5E-06
TOLUENE	2.5E+06	4.2E+06	1.6E+06	1.2E-07	7.2E-08	1.9E-07	0.0E+00
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	7.0E-09
ARSENIC	2.2E+01	0.0E+00	2.2E+01	6.9E-01*	0.0E+00	6.9E-01*	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	1.1E-02	0.0E+00	1.1E-02	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.8E-04	0.0E+00	1.8E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.2E-03	0.0E+00	5.2E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	6.3E-04	0.0E+00	6.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.3E-04	0.0E+00	1.3E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1d-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	1.3E+05	2.1E-01	3.4E+01*	5.6E-05	3.4E+01*	0.0E+00
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.8E-05
CHLOROPHENYLMETHYL SULFIDE	7.0E+04	1.4E+05	4.7E+04	1.1E-04	5.5E-05	1.7E-04	0.0E+00
CHLOROPHENYLMETHYL SULFONE	7.0E+04	9.9E+04	4.1E+04	1.0E-05	2.0E-05	3.0E-05	0.0E+00
CHLOROPHENYLMETHYL SULFOXIDE	7.0E+04	9.6E+04	4.0E+04	5.7E-05	4.1E-05	9.9E-05	0.0E+00
DIELDRIN	2.2E-01	1.0E+06	2.2E-01	4.6E+01*	8.3E-03a	4.6E+01*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	5.1E-10
DITHIANE	3.5E+04	0.0E+00	3.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.1E+03	2.3E+06	1.1E+03	9.5E-04	4.4E-07	9.5E-04	0.0E+00
FLUOROACETIC ACID	1.7E+01	0.0E+00	1.7E+01	9.1E-01*	0.0E+00	9.1E-01*	0.0E+00
ISODRIN	2.5E+02	4.4E+05	2.5E+02	2.0E-03	1.1E-06	2.0E-03	0.0E+00
METHYLENE CHLORIDE	4.5E+02	8.7E+02	3.0E+02	0.0E+00	1.1E-03	1.1E-03	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	0.0E+00	7.1E+01	0.0E+00	0.0E+00	0.0E+00	5.3E-05
TOLUENE	1.1E+06	1.5E+06	6.2E+05	2.8E-07	2.0E-07	4.8E-07	0.0E+00
1,1,1-TRICHLOROETHANE	3.2E+05	0.0E+00	3.2E+05	0.0E+00	0.0E+00	0.0E+00	4.5E-08
ARSENIC	3.9E+00	0.0E+00	3.9E+00	3.8E+00*	0.0E+00	3.8E+00*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	8.8E-02	0.0E+00	8.8E-02	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	3.1E-04	0.0E+00	3.1E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	8.8E-03	0.0E+00	8.8E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	1.1E-03	0.0E+00	1.1E-03	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	2.4E-04	0.0E+00	2.4E-04	0.0E+00

a: This contaminant saturates the soil gas and produces a vapor flux which is below one-tenth of the critical flux. The SPPPLV for this contaminant is considered to be equal to pure compound. The SPPPLV has therefore been set to 1.00E+06 mg/kg (See volume VI-A).

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1d-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	1.3E+02	1.9E+00	3.7E+00*	5.6E-02	3.8E+00*	0.0E+00
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	5.7E-04
CHLOROPHENYLMETHYL SULFIDE	9.1E+04	2.1E+03	2.1E+03	8.8E-05	3.8E-03	3.9E-03	0.0E+00
CHLOROPHENYLMETHYL SULFONE	9.1E+04	6.8E+02	6.7E+02	7.7E-06	3.0E-03	3.0E-03	0.0E+00
CHLOROPHENYLMETHYL SULFOXIDE	9.1E+04	2.1E+03	2.1E+03	4.4E-05	1.9E-03	1.9E-03	0.0E+00
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	5.0E+00*	1.7E-01*	5.2E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	1.1E-07
DITHIANE	4.6E+04	0.0E+00	4.6E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.4E+03	2.9E+02	2.4E+02	7.3E-04	3.5E-03	4.2E-03	0.0E+00
FLUOROACETIC ACID	2.2E+01	0.0E+00	2.2E+01	7.0E-01*	0.0E+00	7.0E-01*	0.0E+00
ISODRIN	3.2E+02	6.7E+01	5.5E+01	1.6E-03	7.5E-03	9.0E-03	0.0E+00
METHYLENE CHLORIDE	4.1E+03	6.0E+00	5.9E+00	0.0E+00	1.7E-01*	1.7E-01*	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	0.0E+00	6.5E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-03
TOLUENE	1.4E+06	3.2E+03	3.2E+03	2.2E-07	9.3E-05	9.3E-05	0.0E+00
1,1,1-TRICHLOROETHANE	4.2E+05	0.0E+00	4.2E+05	0.0E+00	0.0E+00	0.0E+00	1.0E-05
ARSENIC	2.0E+01	0.0E+00	2.0E+01	7.5E-01*	0.0E+00	7.5E-01*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	1.4E-02	0.0E+00	1.4E-02	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	4.4E-04	0.0E+00	4.4E-04	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	1.2E-02	0.0E+00	1.2E-02	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.5E-03	0.0E+00	1.5E-03	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	3.2E-04	0.0E+00	3.2E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-1d-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	2.5E+05	4.2E+01	1.2E-01	6.0E+01*	1.7E-01*	6.0E+01*	0.0E+00	0.0E+00
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	9.0E-06	1.7E-03
CHLOROPHENYLMETHYL SULFIDE	1.7E+04	4.2E+05	6.3E+03	4.5E+03	4.8E-04	1.3E-03	1.8E-03	0.0E+00	0.0E+00
CHLOROPHENYLMETHYL SULFONE	1.7E+04	8.5E+04	6.8E+02	6.5E+02	4.2E-05	3.0E-03	3.0E-03	0.0E+00	0.0E+00
CHLOROPHENYLMETHYL SULFOXIDE	1.7E+04	8.3E+04	6.3E+03	4.4E+03	2.4E-04	6.8E-04	9.2E-04	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	2.4E+03	1.9E+01	1.2E-01	8.2E+01*	5.3E-01*	8.2E+01*	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	5.9E-10	1.1E-07
DITHIANE	8.5E+03	0.0E+00	0.0E+00	8.5E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+02	2.0E+06	8.6E+02	2.0E+02	3.9E-03	1.2E-03	5.1E-03	0.0E+00	0.0E+00
FLUOROACETIC ACID	4.0E+00	0.0E+00	0.0E+00	4.0E+00	3.8E+00*	0.0E+00	3.8E+00*	0.0E+00	0.0E+00
ISODRIN	5.9E+01	3.8E+05	2.0E+02	4.6E+01	8.4E-03	2.5E-03	1.1E-02	0.0E+00	0.0E+00
METHYLENE CHLORIDE	2.5E+02	7.5E+02	6.0E+00	5.8E+00	0.0E+00	1.7E-01*	1.7E-01*	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	2.6E-05	5.0E-03
TOLUENE	2.6E+05	5.6E+05	9.7E+03	9.2E+03	1.2E-06	3.1E-05	3.3E-05	0.0E+00	0.0E+00
1,1,1-TRICHLOROETHANE	7.8E+04	0.0E+00	0.0E+00	7.8E+04	0.0E+00	0.0E+00	0.0E+00	5.3E-08	1.0E-05
ARSENIC	1.6E+00	0.0E+00	0.0E+00	1.6E+00	9.3E+00*	0.0E+00	9.3E+00*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	6.7E-01*	0.0E+00	6.7E-01*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.3E-03	0.0E+00	1.3E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.7E-02	0.0E+00	3.7E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	4.6E-03	0.0E+00	4.6E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.8E-03	0.0E+00	1.8E-03	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.5 SITE CSA-2a: MUNITIONS TEST BUILDINGS (formerly Site 36-2: Munitions Test Area and Incendiary Drop Site; ESE, 1988h/RIC 88063R04 and ESE, 1988i/ RIC 88063R04A)

2.5.1 Site-Specific Considerations

Figure CSA-2a-1 and Tables CSA-2a-1 and CSA-2a-2 depict the target contaminants for Site CSA-2a. Borings 3715 through 3717 were used in this exposure assessment, consistent with the Central SAR. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site CSA-2a (ESE, 1988h/RIC 88063R04).

2.5.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-2a are shown in Figure CSA-2a-1. Table CSA-2a-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-2a-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.5.3 Site Exposure Summary

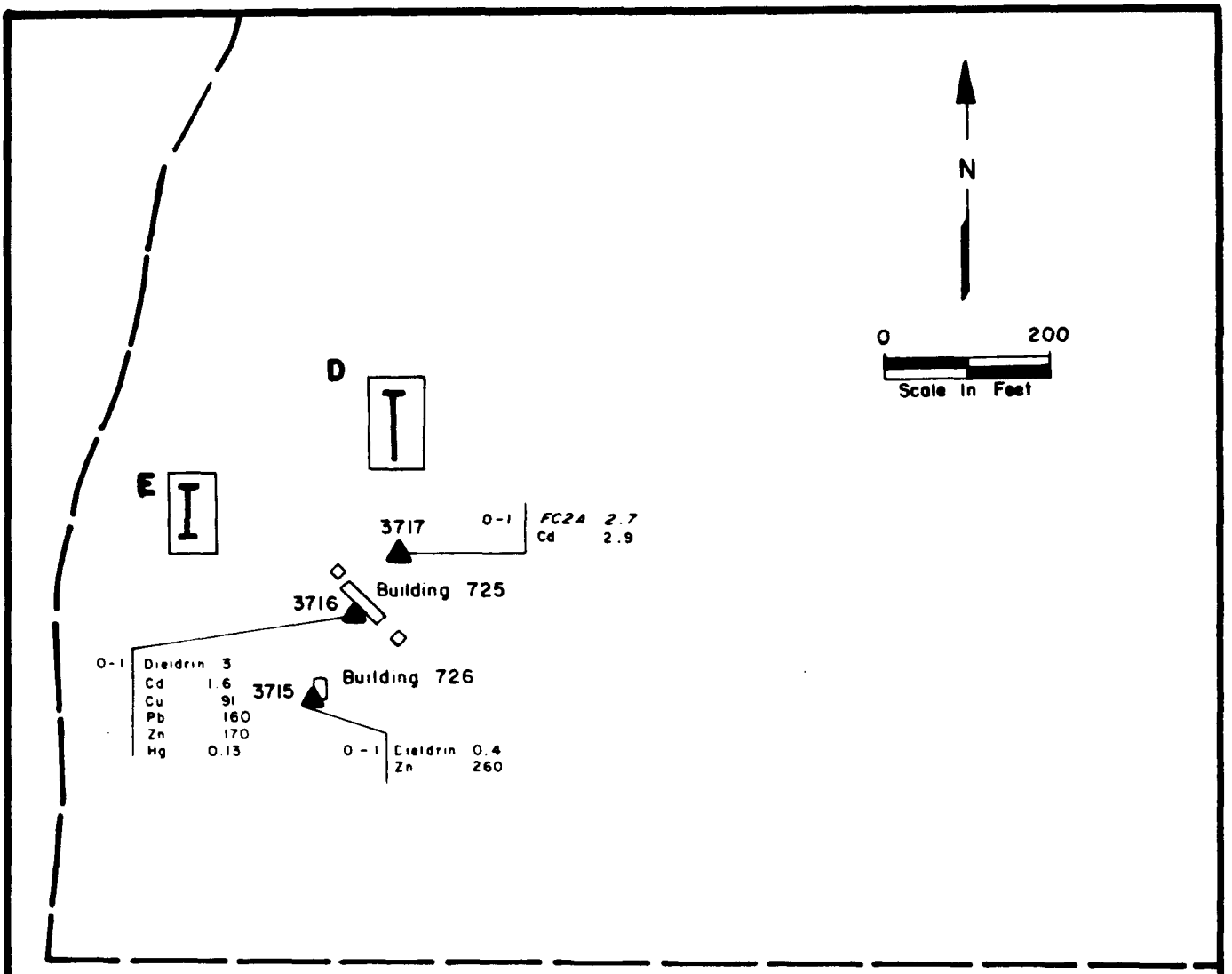
Tables CSA-2a-3 through CSA-2a-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified. The depth to groundwater below Site CSA-2a is less than 10 ft, therefore the enclosed space vapor inhalation exposure pathway is not included in the calculation of the cumulative quantities.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Dieldrin	Direct	Direct	Direct	Direct	Dir/Ind
Fluoroacetic acid	--	--	Direct	Direct	Direct
Cadmium	--	--	--	--	Direct

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs for an industrial worker. Site CSA-2a is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.



Legend

- Phase I Boring
- Phase II Boring
- Site Boundary
- Excavation Location
- Geophysical Anomaly; D, E

FC2A - Fluoroacetic acid
Cd - Cadmium
Cu - Copper
Pb - Lead
Hg - Mercury
Zn - Zinc

Sample Interval (ft) → 0 - 1 | Hg 0.17 ← Level (ug/g)
4 - 5 | PPDDE 0.0098 ← Analytes detected by different method in Phase II - See Text
7 - 8 | BIL ← Bedrock Sample

BIL - Below Indicator Level

Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

SOURCE: HLA, 1988

FIGURE CSA-2a-1
Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE CSA-2a-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-2a

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Dieldrin	3	0-1	3716	3	0-1	3716
Fluoroacetic acid	2.7	0-1	3717	2.7	0-1	3717
Cadmium	2.9	0-1	3717	--	--	--
Copper	91	0-1	3716	--	--	--
Lead	160	0-1	3716	--	--	--
Mercury	0.13	0-1	3716	--	--	--
Zinc	260	0-1	3715	--	--	--

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-2a-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-2a

AVERAGE SITE DEPTH TO GROUNDWATER: 8 Feet

CHEMICAL	CONCENTRATION MAXIMUM		LOCATION (WELL NUMBER)	SAMPLE DATE
BENZENE		250	36592	02/16/88
CARBON TETRACHLORIDE		2000	36592	02/16/88
CHLOROFORM		1000	36592	02/16/88
CHLOROBENZENE	GT	1000	36592	02/16/88
CHLOROPHENYLMETHYL SULFIDE		40	36592	02/16/88
CHLOROPHENYLMETHYL SULFOXIDE		32	36592	02/16/88
CHLOROPHENYLMETHYL SULFONE		7.6	36592	02/16/88
DIBROMOCHLOROPROPANE		21	36592	02/16/88
DIISOPROPYLMETHYL PHOSPHONATE		33	36592	02/16/88
TETRACHLOROETHYLENE		26	36592	02/16/88
TRICHLOROETHYLENE		440	36592	02/16/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-2a-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIELDRIN	1.6E+00	2.0E+07	1.6E+00	1.9E+00*	1.5E-07	1.9E+00*	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	7.0E-02	0.0E+00	7.0E-02	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	6.4E-03	0.0E+00	6.4E-03	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	2.2E-04	0.0E+00	2.2E-04	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	3.6E-06
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	5.0E-04
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.2E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-10
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.6E-13
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	3.7E-12
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	6.3E-07
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.1E-11
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	5.6E-06
LEAD	1.5E+04	0.0E+00	1.5E+04	1.0E-02	0.0E+00	1.0E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.9E-05	0.0E+00	3.9E-05	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.3E-04	0.0E+00	1.3E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2a-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIELDRIN	1.6E+00	2.0E+07	1.6E+00	1.9E+00*	1.5E-07	1.9E+00*	0.0E+00
FLUOROACETIC ACID	3.9E+01	0.0E+00	3.9E+01	7.0E-02	0.0E+00	7.0E-02	0.0E+00
CADMIUM	4.5E+02	0.0E+00	4.5E+02	6.4E-03	0.0E+00	6.4E-03	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	2.2E-04	0.0E+00	2.2E-04	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	3.6E-06
CARBON TETRACHLORIDE	2.0E+02	0.0E+00	2.0E+02	0.0E+00	0.0E+00	0.0E+00	5.0E-04
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	1.2E-07
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.2E-06
CHLOROPHENYLMETHYL SULFIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	2.0E-10
CHLOROPHENYLMETHYL SULFONE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.6E-13
CHLOROPHENYLMETHYL SULFOXIDE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	3.7E-12
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	6.3E-07
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	1.1E-11
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-07
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	5.6E-06
LEAD	1.5E+04	0.0E+00	1.5E+04	1.0E-02	0.0E+00	1.0E-02	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.9E-05	0.0E+00	3.9E-05	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.3E-04	0.0E+00	1.3E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2a-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIELDRIN	2.2E-01	1.3E+06	2.2E-01	1.4E+01*	2.2E-06	1.4E+01*	0.0E+00
FLUOROACETIC ACID	1.7E+01	0.0E+00	1.7E+01	1.6E-01*	0.0E+00	1.6E-01*	0.0E+00
CADMIUM	5.8E+01	0.0E+00	5.8E+01	5.0E-02	0.0E+00	5.0E-02	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	3.7E-04	0.0E+00	3.7E-04	0.0E+00
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	5.5E-05
CARBON TETRACHLORIDE	2.7E+01	0.0E+00	2.7E+01	0.0E+00	0.0E+00	0.0E+00	7.6E-03
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	8.0E-07
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	3.3E-05
CHLOROPHENYLMETHYL SULFIDE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	1.3E-09
CHLOROPHENYLMETHYL SULFONE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.9E-12
CHLOROPHENYLMETHYL SULFOXIDE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.4E-11
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	9.5E-06
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	7.1E-11
TETRACHLOROETHYLENE	7.1E+01	0.0E+00	7.1E+01	0.0E+00	0.0E+00	0.0E+00	2.5E-06
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	8.4E-05
LEAD	9.2E+03	0.0E+00	9.2E+03	1.7E-02	0.0E+00	1.7E-02	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	6.6E-05	0.0E+00	6.6E-05	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	2.5E-04	0.0E+00	2.5E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2a-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	1.5E+00*	5.2E-02	1.6E+00*	0.0E+00
FLUOROACETIC ACID	2.2E+01	0.0E+00	2.2E+01	1.3E-01*	0.0E+00	1.3E-01*	0.0E+00
CADMIUM	3.6E+02	0.0E+00	3.6E+02	8.1E-03	0.0E+00	8.1E-03	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	5.2E-04	0.0E+00	5.2E-04	0.0E+00
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	NA
CARBON TETRACHLORIDE	2.5E+02	0.0E+00	2.5E+02	0.0E+00	0.0E+00	0.0E+00	NA
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	NA
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	NA
CHLOROPHENYLMETHYL SULFIDE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	NA
CHLOROPHENYLMETHYL SULFONE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	NA
CHLOROPHENYLMETHYL SULFOXIDE	9.1E+04	0.0E+00	9.1E+04	0.0E+00	0.0E+00	0.0E+00	NA
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	NA
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	NA
TETRACHLOROETHYLENE	6.5E+02	0.0E+00	6.5E+02	0.0E+00	0.0E+00	0.0E+00	NA
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	NA
LEAD	6.5E+03	0.0E+00	6.5E+03	2.5E-02	0.0E+00	2.5E-02	NA
MERCURY	1.4E+03	0.0E+00	1.4E+03	9.3E-05	0.0E+00	9.3E-05	NA
ZINC	7.8E+05	0.0E+00	7.8E+05	3.3E-04	0.0E+00	3.3E-04	NA

*: EI is equal to or exceeds 1.0E-01

CSA-2a-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
DIELDRIN	1.2E-01	2.7E+06	1.9E+01	1.2E-01	2.5E+01*	1.6E-01*	2.5E+01*	0.0E+00	0.0E+00
FLUOROACETIC ACID	4.0E+00	0.0E+00	0.0E+00	4.0E+00	6.8E-01*	0.0E+00	6.8E-01*	0.0E+00	0.0E+00
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	3.8E-01*	0.0E+00	3.8E-01*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.6E-03	0.0E+00	1.6E-03	0.0E+00	0.0E+00
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	2.7E-05	NA
CARBON TETRACHLORIDE	1.5E+01	0.0E+00	0.0E+00	1.5E+01	0.0E+00	0.0E+00	0.0E+00	3.8E-03	NA
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	9.3E-07	NA
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-05	NA
CHLOROPHENYLMETHYL SULFIDE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	1.5E-09	NA
CHLOROPHENYLMETHYL SULFONE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-12	NA
CHLOROPHENYLMETHYL SULFOXIDE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.8E-11	NA
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-06	NA
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	8.3E-11	NA
TETRACHLOROETHYLENE	4.1E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	1.3E-06	NA
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	4.2E-05	NA
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	7.3E-02	0.0E+00	7.3E-02	0.0E+00	NA
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	2.8E-04	0.0E+00	2.8E-04	0.0E+00	NA
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.9E-03	0.0E+00	1.9E-03	0.0E+00	NA

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.6 SITE CSA-2b: PARKING LOT/SCRAP STORAGE (formerly Site 36-23: Scrap Metal Storage/Parking Lot; ESE, 1988j/RIC 88173R04 and ESE, 1988k/ RIC 88173R04A)

2.6.1 Site-Specific Considerations

Figure CSA-2b-1 and Table CSA-2b-1 depict the target contaminants for Site CSA-2b. Borings 3035, 3568 through 3574, 3713, and 3714 were used in this exposure assessment, consistent with the Central SAR. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site CSA-2b (ESE, 1988j/RIC 88173R04).

2.6.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-2b are shown in Figure CSA-2b-1. Toluene, occurring in Borings 3569 (0-1 ft), 3570 (0-1 ft), 3571 (0-1 ft) and 3572 (0-1 ft) was not included in the figure because it was detected in the nontarget analysis, but it is still considered a target contaminant for this exposure assessment (see Appendix A). The following contaminants were not included in the figure, since they were not considered target contaminants during the Phase I and Phase II investigations: Fluoranthene, occurring in Boring 3571 (0-1 ft); and pyrene, occurring in Boring 3572 (0-1 ft). Although not shown in this figure, these nontarget compounds were included in the CSA Report and in this exposure assessment because they passed through the screening process performed in the RMA Chemical Index (EBASCO 1988a/RIC 88357R01).

Table CSA-2b-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

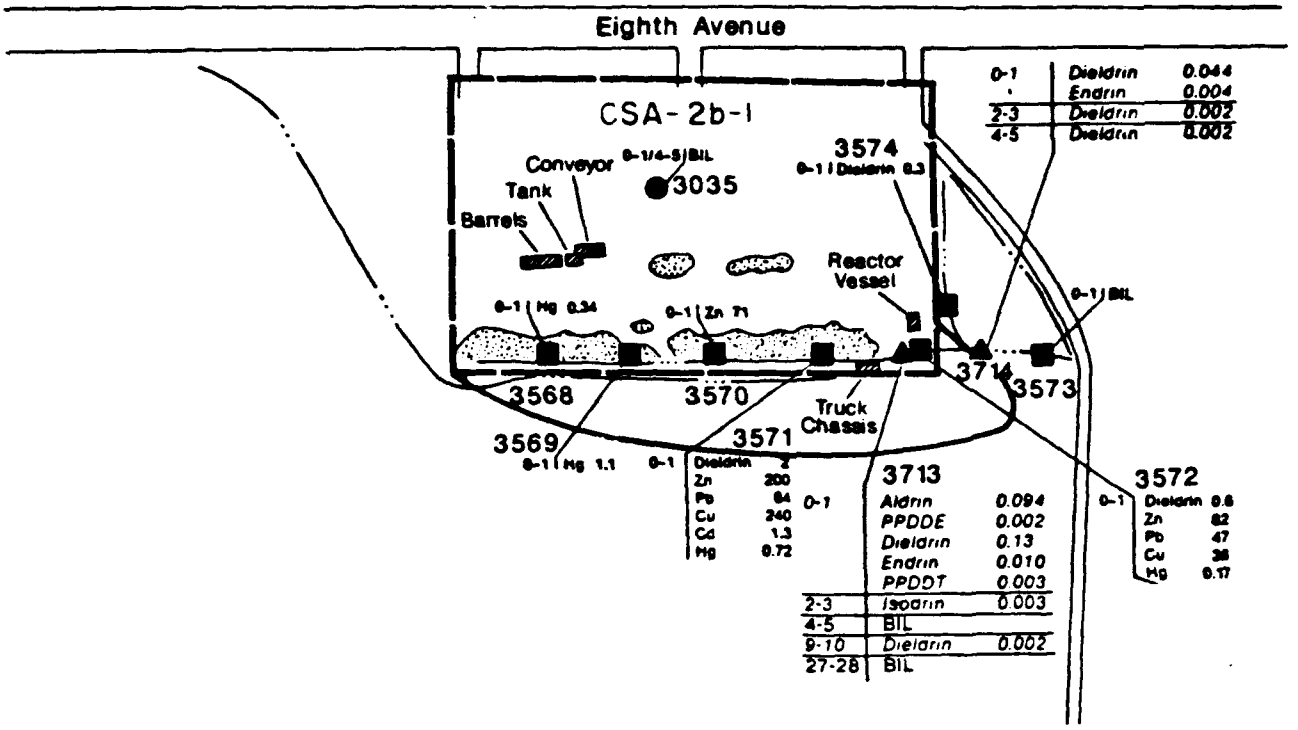
2.6.3 Site Exposure Summary

Tables CSA-2b-2 through CSA-2b-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Dieldrin	Direct	Direct	Direct	Direct	Dir/Ind
Aldrin	--	--	Direct	Indirect	Dir/Ind

Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.
Indirect exposure pathways include open and enclosed space vapor inhalation.

The results of the soil exposure summary indicate that exposure to contamination from the direct and indirect pathways both contribute to the exceedance of the cumulative PPLVs. Site CSA-2b is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Legend

- Phase I boring
- Phase I Hand Driven Sample (0-1 Ft)
- Phase II boring
- Site Boundary
- Ditch
- Scrap Metal Pile

Sample Interval (feet) → 0-1 | Aldrin 0.001 ← Level (ug/g)
4-5 | Dieldrin 0.0048
7-8
Bedrock Sample

Analyte

Analyte detected by different method in Phase II - see text

BIL - Below Indicator Level

PPDDE - 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
PPDDT - 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
Cd - Cadmium
Cu - Copper
Pb - Lead
Hg - Mercury
Zn - Zinc

-N-

0 200
SCALE IN FEET

Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

Source: ESE, 1988 & HLA, 1988

FIGURE CSA-2b-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE CSA-2b-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-2b

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	0.094	0-1	3713	0.094	0-1	3713
PPDDE[1/]	0.002	0-1	3713	0.002	0-1	3713
PPDDT[2/]	0.003	0-1	3713	0.003	0-1	3713
Dieldrin	2	0-1	3571	2	0-1	3571
Endrin	0.010	0-1	3713	0.010	0-1	3713
Fluoranthene[3/]	0.90	0-1	3571	0.90	0-1	3571
Isodrin	0.003	2-3	3713	0.003	2-3	3713
Pyrene[3/]	1.0	0-1	3572	1.0	0-1	3572
Toluene	1.0	0-1	3569	1.0	0-1	3569
Copper	240	0-1	3571	--	--	--
Lead	84	0-1	3571	--	--	--
Mercury	1.1	0-1	3569	--	--	--
Zinc	200	0-1	3571	--	--	--

1/ PPDDE 2,2-bis(Para-chlorophenyl)-1,1-dichloroethene
2/ PPDDT 2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane
3/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

CSA-2b-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	6.1E+04	1.5E+00	6.3E-02	1.5E-06	6.3E-02	0.0E+00
PPDDE	7.4E+01	3.7E+06	7.4E+01	2.7E-05	5.4E-10	2.7E-05	0.0E+00
PPDDT	7.4E+01	7.8E+06	7.4E+01	4.1E-05	3.9E-10	4.1E-05	0.0E+00
DIELDRIN	1.6E+00	2.8E+04	1.6E+00	1.3E+00*	7.2E-05	1.3E+00*	0.0E+00
ENDRIN	2.5E+03	2.3E+07	2.5E+03	4.0E-06	4.4E-10	4.0E-06	0.0E+00
ISODRIN	5.8E+02	1.4E+07	5.8E+02	5.2E-06	2.1E-10	5.2E-06	0.0E+00
TOLUENE	2.5E+06	5.3E+07	2.4E+06	4.0E-07	1.9E-08	4.2E-07	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	5.7E-04	0.0E+00	5.7E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.4E-03	0.0E+00	5.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.3E-04	0.0E+00	3.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.0E-04	0.0E+00	1.0E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2b-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	6.1E+04	1.5E+00	6.3E-02	1.5E-06	6.3E-02	0.0E+00
PPDDE	7.4E+01	3.7E+06	7.4E+01	2.7E-05	5.4E-10	2.7E-05	0.0E+00
PPDDT	7.4E+01	7.8E+06	7.4E+01	4.1E-05	3.9E-10	4.1E-05	0.0E+00
DIELDRIN	1.6E+00	2.8E+04	1.6E+00	1.3E+00*	7.2E-05	1.3E+00*	0.0E+00
ENDRIN	2.5E+03	2.3E+07	2.5E+03	4.0E-06	4.4E-10	4.0E-06	0.0E+00
ISODRIN	5.8E+02	1.4E+07	5.8E+02	5.2E-06	2.1E-10	5.2E-06	0.0E+00
TOLUENE	2.5E+06	5.3E+07	2.4E+06	4.0E-07	1.9E-08	4.2E-07	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	5.7E-04	0.0E+00	5.7E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	5.4E-03	0.0E+00	5.4E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.3E-04	0.0E+00	3.3E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	1.0E-04	0.0E+00	1.0E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2b-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	4.0E+03	2.1E-01	4.5E-01*	2.3E-05	4.5E-01*	0.0E+00
PPDDE	1.0E+01	2.4E+05	1.0E+01	2.0E-04	8.2E-09	2.0E-04	0.0E+00
PPDDT	1.0E+01	5.2E+05	1.0E+01	2.9E-04	5.8E-09	2.9E-04	0.0E+00
DIELDRIN	2.2E-01	1.8E+03	2.2E-01	9.2E+00*	1.1E-03	9.2E+00*	0.0E+00
ENDRIN	1.1E+03	3.5E+06	1.1E+03	9.5E-06	2.9E-09	9.5E-06	0.0E+00
ISODRIN	2.5E+02	2.2E+06	2.5E+02	1.2E-05	1.4E-09	1.2E-05	0.0E+00
TOLUENE	1.1E+06	1.9E+07	1.0E+06	9.4E-07	5.2E-08	1.0E-06	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	9.7E-04	0.0E+00	9.7E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	9.1E-03	0.0E+00	9.1E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	5.6E-04	0.0E+00	5.6E-04	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.9E-04	0.0E+00	1.9E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2b-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ALDRIN	1.9E+00	4.0E-01	3.3E-01	5.0E-02	2.4E-01*	2.9E-01*	0.0E+00
PPDDE	9.3E+01	1.9E+01	1.6E+01	2.1E-05	1.0E-04	1.2E-04	0.0E+00
PPDDT	9.3E+01	1.9E+01	1.6E+01	3.2E-05	1.5E-04	1.9E-04	0.0E+00
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	1.0E+00*	3.5E-02	1.0E+00*	0.0E+00
ENDRIN	1.4E+03	2.9E+02	2.4E+02	7.3E-06	3.5E-05	4.2E-05	0.0E+00
ISODRIN	3.2E+02	6.7E+01	5.5E+01	9.4E-06	4.5E-05	5.4E-05	0.0E+00
TOLUENE	1.4E+06	5.5E+05	3.9E+05	7.2E-07	1.8E-06	2.6E-06	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	1.4E-03	0.0E+00	1.4E-03	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	1.3E-02	0.0E+00	1.3E-02	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	7.9E-04	0.0E+00	7.9E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	2.6E-04	0.0E+00	2.6E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2b-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	8.1E+03	4.0E-01	9.0E-02	8.1E-01*	2.4E-01*	1.0E+00*	0.0E+00	0.0E+00
PPDDE	5.7E+00	4.9E+05	1.9E+01	4.4E+00	5.2E-04	1.0E-04	4.5E-04	0.0E+00	0.0E+00
PPDDT	5.7E+00	1.0E+06	1.9E+01	4.4E+00	5.2E-04	1.5E-04	6.8E-04	0.0E+00	0.0E+00
DIELDRIN	1.2E-01	3.7E+03	1.9E+01	1.2E-01	1.6E+01*	1.0E-01*	1.6E+01*	0.0E+00	0.0E+00
ENDRIN	2.5E+02	3.0E+06	8.6E+02	2.0E+02	3.9E-05	1.2E-05	5.1E-05	0.0E+00	0.0E+00
ISODRIN	5.9E+01	1.9E+06	2.0E+02	4.6E+01	5.1E-05	1.5E-05	6.6E-05	0.0E+00	0.0E+00
TOLUENE	2.6E+05	7.1E+06	1.6E+06	2.2E+05	3.9E-06	7.5E-07	4.6E-06	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	4.2E-03	0.0E+00	4.2E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	3.8E-02	0.0E+00	3.8E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	2.4E-03	0.0E+00	2.4E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	1.4E-03	0.0E+00	1.4E-03	0.0E+00	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.7 SITE CSA-2c: MUNITIONS TEST SITE (formerly Site 36-6/25-17: Probable Test Site with Trench; ESE, 1988l/RIC 88063R05 and ESE, 1988m/RIC 88063R05A)

2.7.1 Site-Specific Considerations

Figure CSA-2c-1 and Table CSA-2c-1 depict the target contaminants for Site CSA-2c. Borings 5554 through 5562, 5564, 5565, 5567, 3301 through 3306, 3309 through 3311, and 3486 through 3490 included in the exposure assessment, consistent with the Central SAR. According to the site history, no chemicals from the RMA target contaminant list were suspected to be present in Site CSA-2c (ESE 1988l/RIC 88063R05).

2.7.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-2c are depicted in Figure CSA-2c-1. Toluene, occurring in Boring 3489 (4-5 ft) and benzothiazole, occurring in Boring 3310 (0-1 ft), were not included in the figure since they were detected in the nontarget analysis during the Phase I investigation, but they are still considered a target contaminant for this exposure assessment (see Appendix A). Methylene chloride, shown in Table CSA-2c-1, is excluded from consideration in the exposure analysis for this site because it was considered a laboratory contaminant in the samples analyzed.

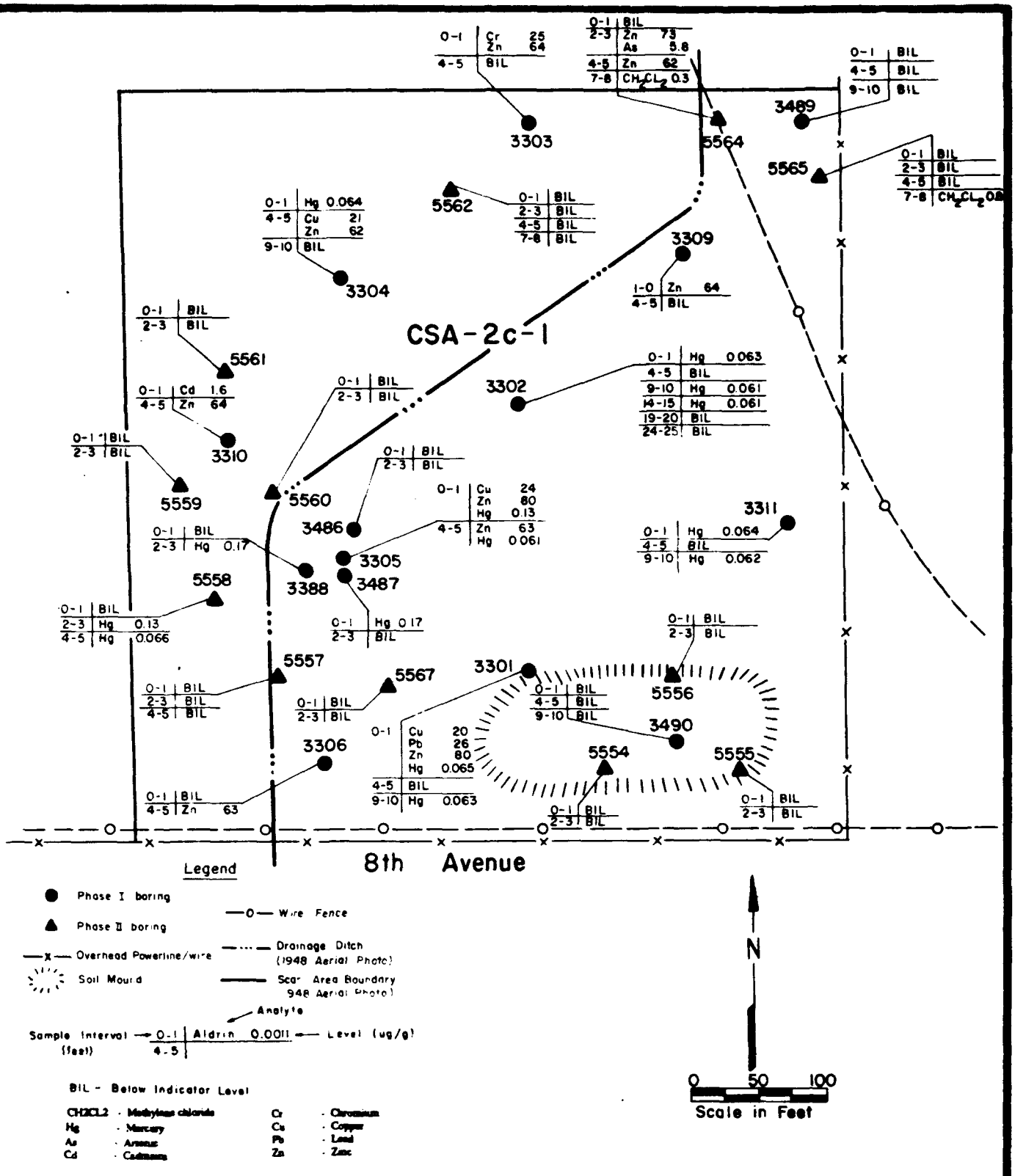
Table CSA-2c-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury for Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Based on available groundwater data from the first quarter 1987 to the first quarter 1989 sampling period, no evidence of groundwater contamination beneath this site was found (see Volume VI-A).

2.7.3 Site Exposure Summary

Tables CSA-2c-2 through CSA-2c-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site CSA-2c is designated as a Priority 2 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for

Program Manager's Office for

Rocky Mountain Arsenal Cleanup

Aberdeen Proving Ground, Maryland

Source: ESE, 1988 & HLA, 1988

FIGURE CSA-2c-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE CSA-2c-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-2c

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Benzothiazole	0.40	0-1	3310	0.40	0-1	3310
Methylene chloride[1/]	0.8	7-8	5565	0.8	7-8	5565
Toluene	8.0	4-5	3489	8.0	4-5	3489
Mercury	0.17	0-1	3487	--	--	--
		2-3	3388	--	--	--

1/ Suspected laboratory contaminant.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

CSA-2c-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZOTHIAZOLE	3.9E+04	6.4E+05	3.7E+04	1.0E-05	6.2E-07	1.1E-05	0.0E+00
TOLUENE	2.5E+06	4.3E+07	2.4E+06	3.2E-06	1.8E-07	3.4E-06	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	5.1E-05	0.0E+00	5.1E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2c-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZOTHIAZOLE	3.9E+04	6.4E+05	3.7E+04	1.0E-05	6.2E-07	1.1E-05	0.0E+00
TOLUENE	2.5E+06	4.3E+07	2.4E+06	3.2E-06	1.8E-07	3.4E-06	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	5.1E-05	0.0E+00	5.1E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2c-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
BENZOTHIAZOLE	1.7E+04	2.3E+05	1.5E+04	2.4E-05	1.7E-06	2.6E-05	0.0E+00
TOLUENE	1.1E+06	1.6E+07	9.9E+05	7.5E-06	5.1E-07	8.1E-06	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	8.6E-05	0.0E+00	8.6E-05	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2c-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
BENZOTHIAZOLE	2.2E+04	4.5E+03	3.7E+03	1.9E-05	8.9E-05	1.1E-04	0.0E+00
TOLUENE	1.4E+06	6.1E+04	5.8E+04	5.8E-06	1.3E-04	1.4E-04	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	1.2E-04	0.0E+00	1.2E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2c-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
BENZOTHIAZOLE	4.0E+03	8.5E+04	1.4E+04	3.0E+03	1.0E-04	3.4E-05	1.3E-04	0.0E+00	0.0E+00
TOLUENE	2.6E+05	5.8E+06	1.8E+05	1.0E+05	3.1E-05	4.5E-05	7.6E-05	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	3.7E-04	0.0E+00	3.7E-04	0.0E+00	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.8 SITE CSA-2d: INCINERATOR NN3601 (formerly Site 36 - Nonsource Area; ESE, 1988n/RIC 88173R01)

2.8.1 Site-Specific Considerations

Figure CSA-2d-1 and Tables CSA-2d-1 and CSA-2d-2 depict the target contaminants for Site CSA-2d. Borings 3118 through 3121 were included in this exposure assessment, consistent with the Central SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site CSA-2d (ESE, 1988n/RIC 88173R01).

2.8.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-2d are depicted in Figure CSA-2d-1. Toluene occurring in Boring 3119 (4-5 ft) was not included in this figure because it was detected in the nontarget analysis, but it is still considered a target contaminant for this exposure assessment (see Appendix A). Table CSA-2d-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-2d-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.8.3 Site Exposure Summary

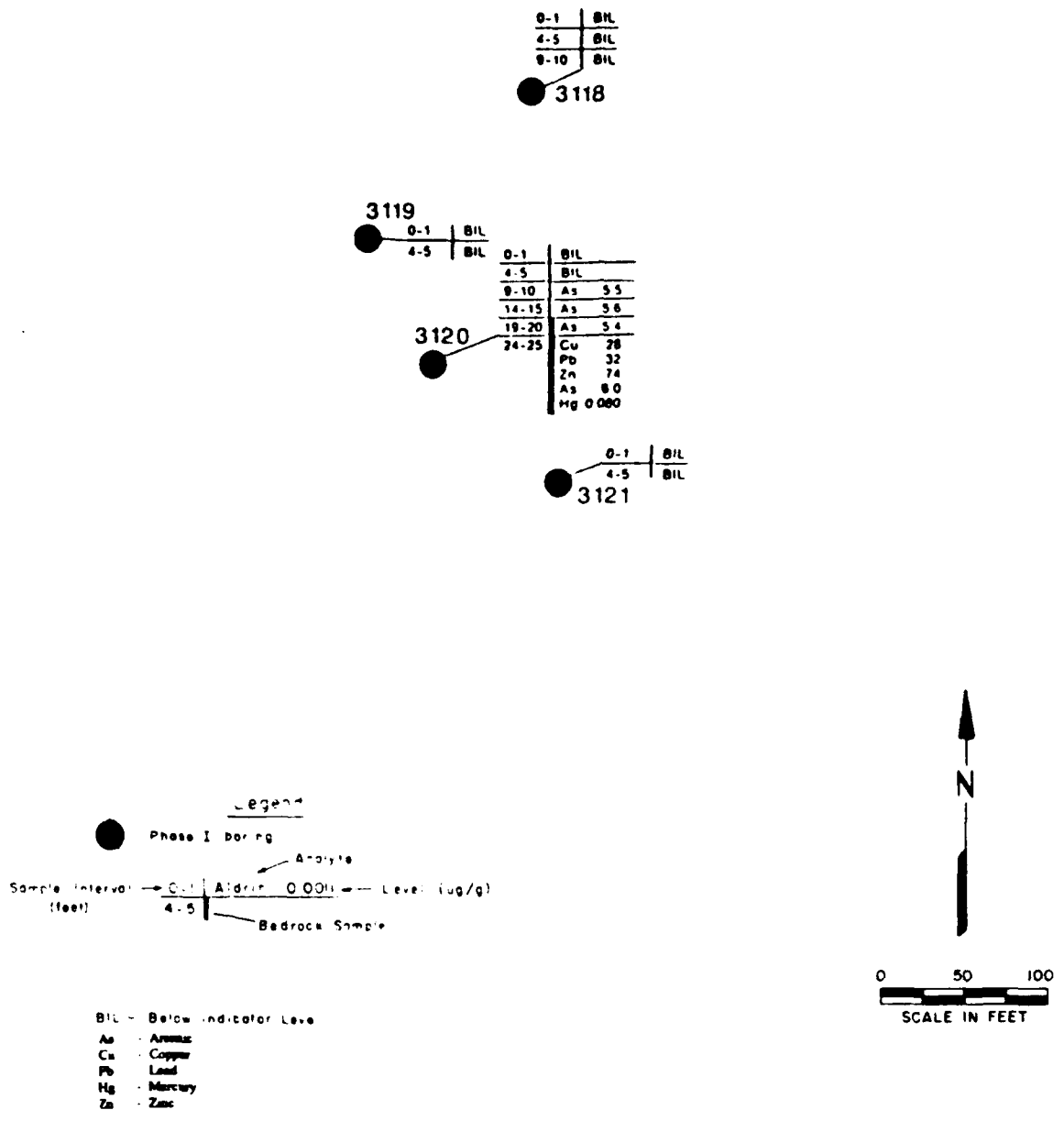
Tables CSA-2d-3 through CSA-2d-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-2d is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The result of the soil exposure summary indicate that there are no COCs. Site CSA-2d is designated as a Priority 2 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

The following groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by a VEI value greater than 1:

- 1,2-Dichloroethane (enclosed)
- Trichloroethylene (enclosed)



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

Source: ESE, 1988 & HLA, 1988

FIGURE CSA-2d-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

TABLE CSA-2d-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-2d

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Toluene	0.6	4-5	3119	0.6	4-5	3119

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-2d-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-2d

AVERAGE SITE DEPTH TO GROUNDWATER: 30 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,2-TRICHLOROETHANE	62	36090	02/8/88
1,2-DICHLOROETHYLENE	36	36090	02/8/88
1,2-DICHLOROETHANE	370	36090	02/9/88
ATRAZINE	20	36090	01/9/89
BENZOTHIAZOLE	29	36090	01/9/89
BENZENE	150	36090	02/9/88
CHLOROFORM	6.9	36090	02/9/88
CHLOROBENZENE	61	36090	02/9/88
DIBROMOCHLOROPROPANE	0.22	36090	01/9/89
DIISOPROPYLMETHYL PHOSPHONATE	2.1	36090	01/9/89
DITHIANE	980	36090	02/8/88
DIMETHYLMETHYL PHOSPHONATE	260	36090	01/9/89
ETHYLBENZENE	6.3	36090	01/9/89
TOLUENE	19	36090	02/9/88
MALATHION	1.1	36090	01/9/89
1,4-OXATHIANE	1100	36090	02/8/88
TETRACHLOROETHYLENE	29	36090	01/9/89

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

TABLE CSA-2d-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-2d

AVERAGE SITE DEPTH TO GROUNDWATER: 30 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
TRICHLOROETHYLENE	200	36090	02/8/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-2d-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ATRAZINE	4.1E+04	0.0E+00	4.1E+04	0.0E+00	0.0E+00	0.0E+00	5.2E-17
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.1E-07
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	9.5E-12
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-10
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	8.0E-10
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	3.5E-10
1,2-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-07
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	3.6E-14
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	8.3E+05	0.0E+00	8.3E+05	0.0E+00	0.0E+00	0.0E+00	3.4E-12
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	3.7E-17
1,4-OXATHIANE	2.5E+05	0.0E+00	2.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	9.8E-09
TOLUENE	2.5E+06	3.8E+10	2.5E+06	2.4E-07	1.6E-11	2.4E-07	2.2E-12
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.9E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-07

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2d-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ATRAZINE	4.1E+04	0.0E+00	4.1E+04	0.0E+00	0.0E+00	0.0E+00	5.2E-17
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.1E-07
BENZOTHIAZOLE	3.9E+04	0.0E+00	3.9E+04	0.0E+00	0.0E+00	0.0E+00	9.5E-12
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-10
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	8.0E-10
DIBROMOCHLOROPROPANE	1.8E+01	0.0E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	3.5E-10
1,2-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.6E-07
1,2-DICHLOROETHYLENE	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	[illegible]00	3.6E-14
DIMETHYMETHYL PHOSPHONATE	1.5E+05	0.0E+00	1.5E+05	0.0E+00	0.0E+00	[illegible]0	0.0E+00
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	[illegible]0	0.0E+00
ETHYLBENZENE	8.3E+05	0.0E+00	8.3E+05	0.0E+00	0.0E+00	0.0E+00	3.4E-12
MALATHION	1.7E+05	0.0E+00	1.7E+05	0.0E+00	0.0E+00	0.0E+00	3.7E-17
1,4-OXATHIANE	2.5E+05	0.0E+00	2.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	9.8E-09
TOLUENE	2.5E+06	3.8E+10	2.5E+06	2.4E-07	1.6E-11	2.4E-07	2.2E-12
1,1,2-TRICHLOROETHANE	4.3E+02	0.0E+00	4.3E+02	0.0E+00	0.0E+00	0.0E+00	1.9E-08
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	1.3E-07

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2d-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ATRAZINE	1.8E+04	0.0E+00	1.8E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-16
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-06
BENZOTHIAZOLE	1.7E+04	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	6.1E-11
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	2.6E-09
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	1.2E-08
DIBROMOCHLOROPROPANE	2.5E+00	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-09
1,2-DICHLOROETHANE	3.9E+01	0.0E+00	3.9E+01	0.0E+00	0.0E+00	0.0E+00	2.4E-06
1,2-DICHLOROETHYLENE	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	2.3E-13
DIMETHYMETHYL PHOSPHONATE	6.3E+04	0.0E+00	6.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	3.5E+04	0.0E+00	3.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	3.5E+05	0.0E+00	3.5E+05	0.0E+00	0.0E+00	0.0E+00	2.2E-11
MALATHION	7.0E+04	0.0E+00	7.0E+04	0.0E+00	0.0E+00	0.0E+00	2.4E-16
1,4-OXATHIANE	1.1E+05	0.0E+00	1.1E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	0.0E+00	7.1E+01	0.0E+00	0.0E+00	0.0E+00	1.5E-07
TOLUENE	1.1E+06	1.4E+10	1.1E+06	5.7E-07	4.4E-11	5.7E-07	1.4E-11
1,1,2-TRICHLOROETHANE	6.0E+01	0.0E+00	6.0E+01	0.0E+00	0.0E+00	0.0E+00	2.8E-07
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	2.0E-06

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2d-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
ATRAZINE	2.3E+04	0.0E+00	2.3E+04	0.0E+00	0.0E+00	0.0E+00	4.4E-10
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	3.2E-01
BENZOTHIAZOLE	2.2E+04	0.0E+00	2.2E+04	0.0E+00	0.0E+00	0.0E+00	8.1E-05
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	3.4E-03
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	2.3E-03
DIBROMOCHLOROPROPANE	2.3E+01	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	9.8E-04
1,2-DICHLOROETHANE	3.5E+02	0.0E+00	3.5E+02	0.0E+00	0.0E+00	0.0E+00	4.5E-01
1,2-DICHLOROETHYLENE	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	3.1E-07
DIMETHYMETHYL PHOSPHONATE	8.2E+04	0.0E+00	8.2E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	4.6E+04	0.0E+00	4.6E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	4.6E+05	0.0E+00	4.6E+05	0.0E+00	0.0E+00	0.0E+00	2.9E-05
MALATHION	9.2E+04	0.0E+00	9.2E+04	0.0E+00	0.0E+00	0.0E+00	3.2E-10
1,4-OXATHIANE	1.4E+05	0.0E+00	1.4E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	0.0E+00	6.5E+02	0.0E+00	0.0E+00	0.0E+00	2.8E-02
TOLUENE	1.4E+06	1.9E+04	1.9E+04	4.3E-07	3.2E-05	3.2E-05	1.9E-05
1,1,2-TRICHLOROETHANE	5.5E+02	0.0E+00	5.5E+02	0.0E+00	0.0E+00	0.0E+00	5.3E-02
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	3.8E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-2d-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ATRAZINE	4.2E+03	0.0E+00	0.0E+00	4.2E+03	0.0E+00	0.0E+00	0.0E+00	3.9E-16	4.4E-10
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	8.4E-07	9.6E-01
BENZOTHIAZOLE	4.0E+03	0.0E+00	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	7.1E-11	8.1E-05
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	3.0E-09	3.4E-03
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	6.0E-09	6.8E-03
DIBROMOCHLOROPROPANE	1.4E+00	0.0E+00	0.0E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-09	2.9E-03
1,2-DICHLOROETHANE	2.2E+01	0.0E+00	0.0E+00	2.2E+01	0.0E+00	0.0E+00	0.0E+00	1.2E-06	1.3E+00
1,2-DICHLOROETHYLENE	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	2.7E-13	3.1E-07
DIMETHYMETHYL PHOSPHONATE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DITHIANE	8.5E+03	0.0E+00	0.0E+00	8.5E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETHYLBENZENE	8.5E+04	0.0E+00	0.0E+00	8.5E+04	0.0E+00	0.0E+00	0.0E+00	2.5E-11	2.9E-05
MALATHION	1.7E+04	0.0E+00	0.0E+00	1.7E+04	0.0E+00	0.0E+00	0.0E+00	2.8E-16	3.2E-10
1,4-OXATHIANE	2.5E+04	0.0E+00	0.0E+00	2.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	7.4E-08	8.4E-02
TOLUENE	2.6E+05	5.0E+09	5.7E+04	4.6E+04	2.3E-06	1.1E-05	1.3E-05	1.6E-11	1.9E-05
1,1,2-TRICHLOROETHANE	3.4E+01	0.0E+00	0.0E+00	3.4E+01	0.0E+00	0.0E+00	0.0E+00	1.4E-07	1.6E-01
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	1.0E-06	1.1E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.9 SITE CSA-3: CHEMICAL SEWERS - NORTH PLANTS (formerly Site 36-20; EBASCO, 1988b/RIC 88286R08)

2.9.1 Site-Specific Considerations

Figure CSA-3-1 and Table CSA-3-1 depict the target contaminants for Site CSA-3. The borings included in this exposure assessment are from sampling area Morrison-Knudson Engineers (MKE) 11 and MKE 22. Since this site is a sewer line, most of the chemicals from the RMA target contaminant list were suspected to be present in Site CSA-3 (EBASCO, 1988b/RIC 88286R08).

2.9.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-3 are depicted in Figure CSA-3-1. Methyl cyclohexane, occurring in Boring MKE 22 (0-1 and 1-2 ft), was not included in the figure, since it was detected in the nontarget analysis. Although not shown in the figure, this nontarget compound was included in the Central SAR and in the exposure assessment because it passed through the screening process performed in the RMA Chemical Index (EBASCO, 1988c/RIC 88357R01).

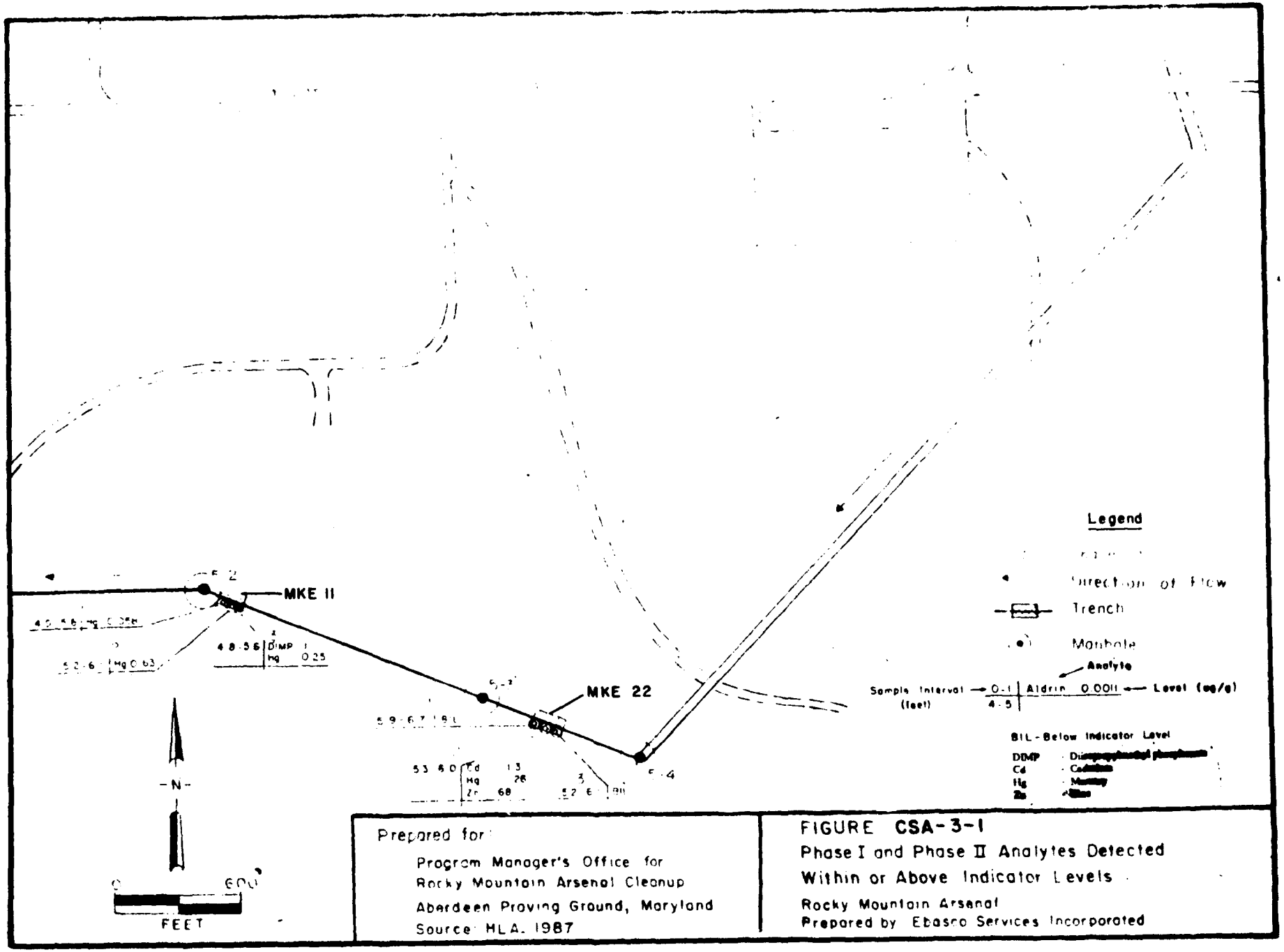
Table CSA-3-1 summarizes the maximum concentration of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, or mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). No groundwater data table was included for Site CSA-3 since this site is a sewer line (see Volume VI-A).

2.9.3 Site Exposure Summary

Tables CSA-3-2 through CSA-3-6 present Draft PPLVs and EIs for each site contaminant. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
None	--	--	--	--	--

The results of the soil exposure summary indicate that there are no COCs. Site CSA-3 is designated as a Priority 2 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).



Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland
Source: HLA, 1987

FIGURE CSA-3-1
Phase I and Phase II Analytes Detected
Within or Above Indicator Levels
Rocky Mountain Arsenal
Prepared by Ebasco Services Incorporated

TABLE CSA-3-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-3

Contaminant	Max. (ug/g)	Depth (ft)	Sampling Area[1/]	Boring Number
Diisopropylmethyl phosphonate	1[2/]	4.8-5.6	MKE 11	3
Methyl cyclohexane[3/]	0.4[2/]	1-2	MKE 22	
		0-1	MKE 22	
Mercury	0.63[2/]	0-1	MKE 11	2

1/ Denotes samples collected by Morrison-Knudsen Engineers (MKE).
2/ Denotes sample results from MKE Sewer Investigation Report - Chemical Sewers - North Plants.
3/ Nontarget contaminant. Refer to the exposure assessment nontarget screen in Appendix A.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

CSA-3-2

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	1.3E+08	6.6E+05	1.5E-06	8.0E-09	1.5E-06	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.9E-04	0.0E+00	1.9E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-3-3

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	1.3E+08	6.6E+05	1.5E-06	8.0E-09	1.5E-06	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	1.9E-04	0.0E+00	1.9E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-3-4

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	4.5E+07	2.8E+05	3.6E-06	2.2E-08	3.6E-06	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	3.2E-04	0.0E+00	3.2E-04	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-3-5

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI ENC
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	7.7E+04	6.3E+04	2.7E-06	1.3E-05	1.6E-05	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	4.5E-04	0.0E+00	4.5E-04	0.0E+00

CSA-3-6

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	1.7E+07	2.3E+05	5.2E+04	1.5E-05	4.4E-06	1.9E-05	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	1.4E-03	0.0E+00	1.4E-03	0.0E+00	0.0E+00

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

2.10 SITE CSA-4: SECTION 36 - LOW-LEVEL OCP DETECTION (formerly Site 36-3: Insecticide Pit; ESE, 1988a/RIC 87203R01A)

2.10.1 Site-Specific Considerations

Figure CSA-4-1 and Tables CSA-4-1 and CSA-4-2 depict the target contaminants for Site CSA-4. Borings 3007 through 3016, 3025, 3032, 3036, 3039, 3044, 3126 through 3132, 3263 through 3288, 3318, 3319, 3332, 3333, 3466, 3471, 3472, 3478, 3718 through 3729 were included in this exposure assessment, consistent with the Central SAR. According to site history, no chemicals from the RMA target contaminant list were suspected to be present in Site CSA-4 (ESE, 1988a/RIC 87203R01A).

2.10.2 Spatial Distribution of Measured Contaminant Concentrations

The locations and concentrations of the target contaminants that were detected in Site CSA-4 are depicted in Figure CSA-4-1. Table CSA-4-1 summarizes the maximum concentrations of contaminants measured in soil above indicator levels for the ICP metals, arsenic, and mercury and CRLs for organic contaminants from the Phase I and Phase II investigations. The boring number and depth where the maximum value was observed are shown. No data were included for ICP metals, arsenic, and mercury in Horizon 2 because direct soil exposure below 10 ft is assumed to be negligible (see Volume VI-A). Table CSA-4-2 summarizes the maximum concentrations detected in groundwater together with the well number, location, sampling interval, and depth to groundwater.

2.10.3 Site Exposure Summary

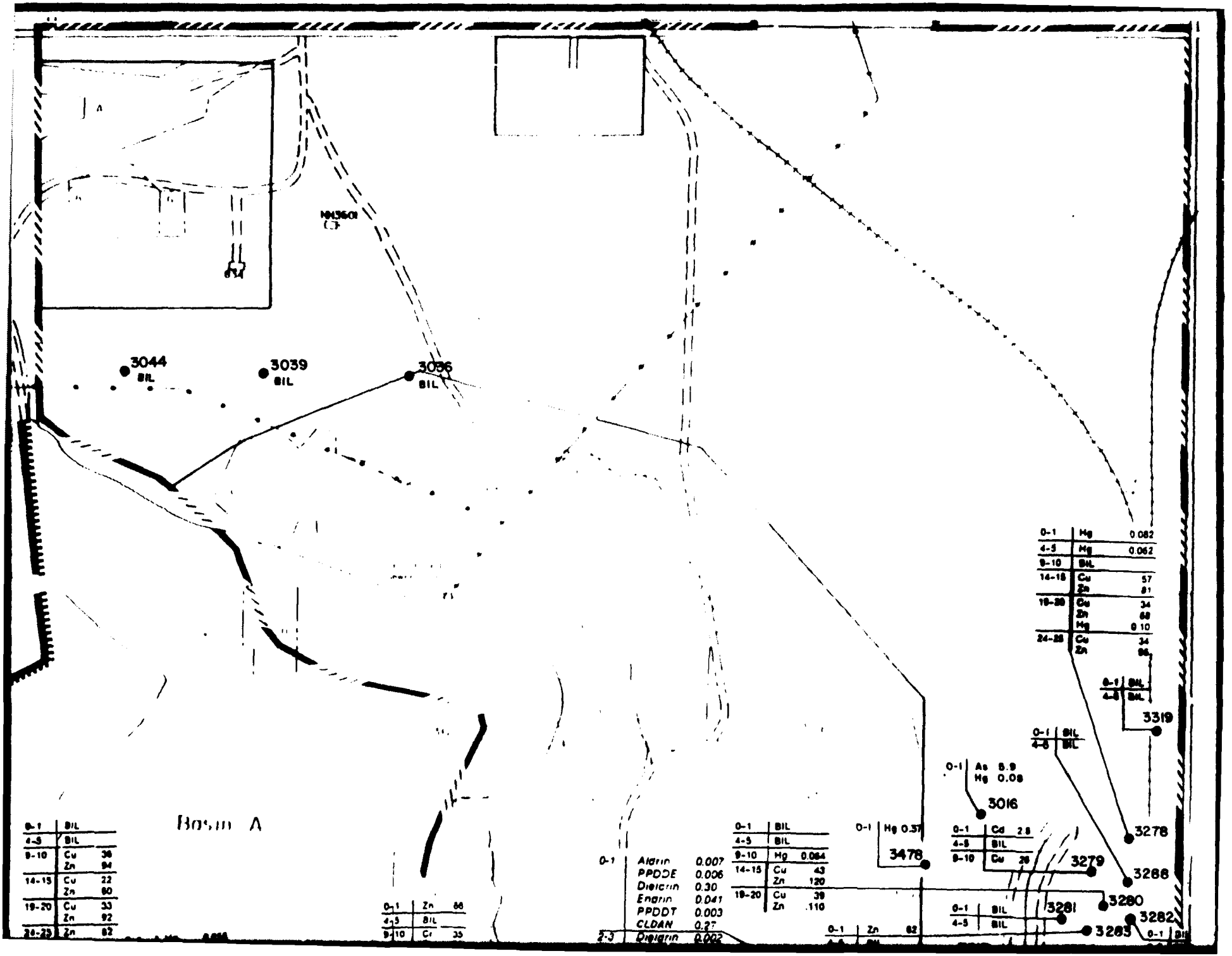
Tables CSA-4-3 through CSA-4-7 present Draft PPLVs, EIs, and VEIs for each site contaminant. Since the depth to groundwater below Site CSA-4 is greater than 10 ft, the enclosed space vapor inhalation SPPPLV is included in the calculation of the cumulative quantity. The COCs are summarized below for each exposed population and with the critical exposure pathway identified.

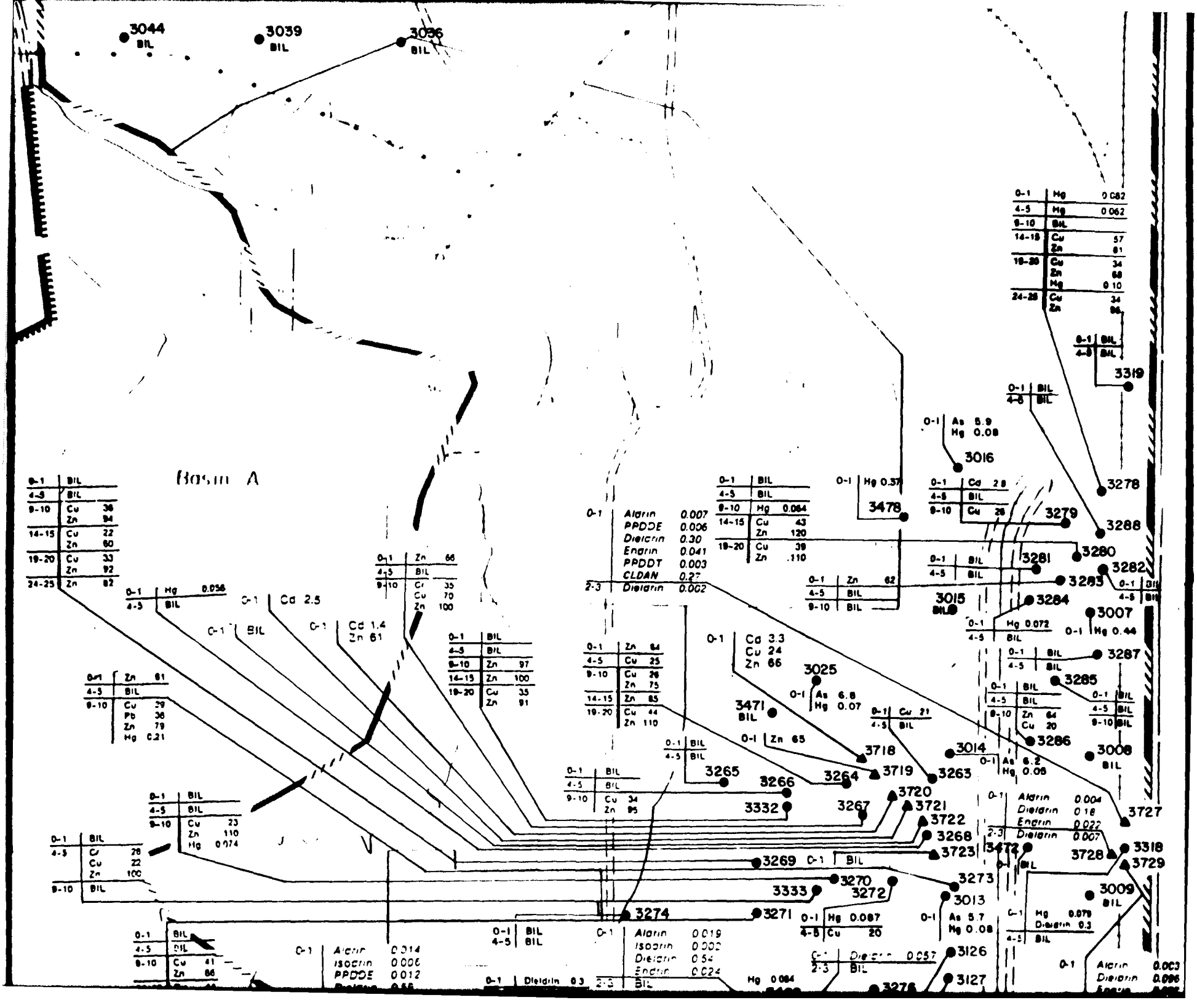
Contaminants of Concern	Regulated Visitor	Casual Visitor	Recreational Visitor	Commercial Worker	Industrial Worker
Dieldrin	Direct	Direct	Direct	Direct	Direct
Aldrin	--	--	--	--	Direct
Chlordane	--	--	--	--	Direct
Cadmium	--	--	--	--	Direct

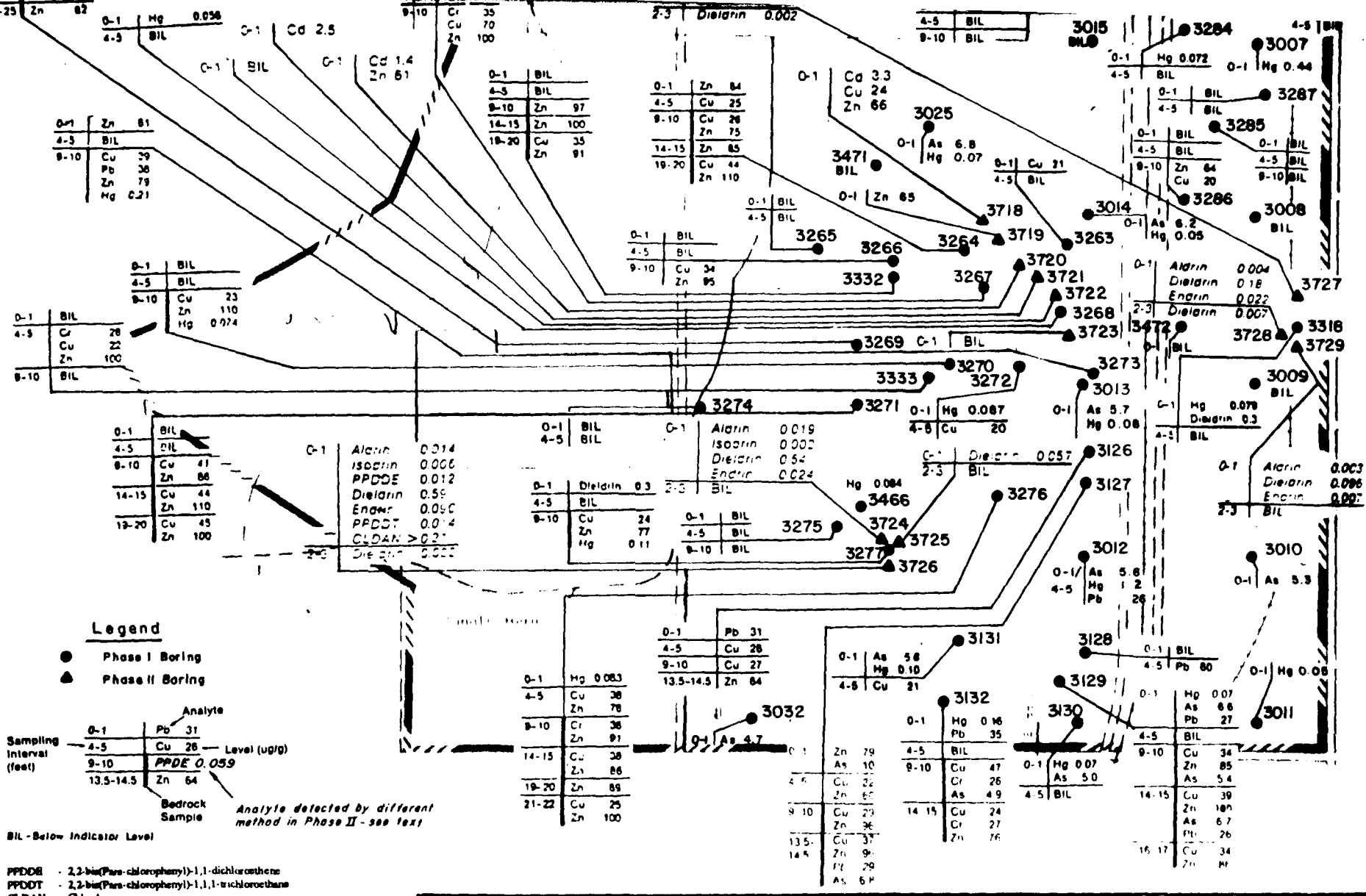
Note: Direct exposure pathways for soils include soil ingestion, suspended particulate inhalation, and dermal contact.

The results of the soil exposure summary indicate that exposure to contamination from the direct pathways are the primary contributors to the exceedance of the cumulative PPLVs. Site CSA-4 is designated as a Priority 1 site based on the most sensitive exposed population PPLV (i.e., the industrial worker).

No groundwater contaminants result in an unacceptable exposure due to vapor inhalation as indicated by VEI values less than 1.


3044
BIL
3039
BIL
3036
BIL
3319
3278
3279
3288
3280
3281
3282
3283
3016
3478
Basin A


Basin A
3044 BIL
3039 BIL
3036 BIL
3319
3016
3278
3279
3288
3280
3281
3282
3283
3284
3015 BIL
3007
3287
3285
3286
3008 BIL
3014
3727
3318
3729
3009 BIL
3728
3472
3126
3127
3276
3478
3025
3471 BIL
3718
3719
3263
3264
3265
3266
3332
3267
3720
3721
3722
3268
3723
3269
3270
3272
3273
3013
3333
3274
3271
0-1 BIL
4-5 BIL
9-10 Cu 36 Zn 94
14-15 Cu 22 Zn 60
19-20 Cu 33 Zn 92
24-25 Zn 82
0-1 Hg 0.056
4-5 BIL
0-1 Cd 2.5
0-1 BIL
0-1 Cd 1.4 Zn 61
0-1 Zn 61
4-5 BIL
9-10 Cu 39 Pb 38 Zn 79 Hg 0.21
0-1 BIL
4-5 BIL
9-10 Cu 23 Zn 110 Hg 0.074
0-1 BIL
4-5 Cu 28 Cu 22 Zn 100
9-10 BIL
0-1 BIL
4-5 BIL
9-10 Cu 41 Zn 86
0-1 Aldrin 0.014 Isodrin 0.006 PPDDE 0.012
0-1 Zn 66
4-5 BIL
9-10 Cr 35 Cu 70 Zn 100
0-1 BIL
4-5 BIL
9-10 Zn 97
14-15 Zn 100
19-20 Cu 35 Zn 91
0-1 Zn 64
4-5 Cu 25
9-10 Cu 26 Zn 75
14-15 Zn 85
19-20 Cu 44 Zn 110
0-1 BIL
4-5 BIL
9-10 Cu 34 Zn 95
0-1 BIL
4-5 BIL
0-1 Aldrin 0.007 PPDDE 0.006 Dieldrin 0.30 Endrin 0.041 PPDDT 0.003 CLDAN 0.27
2-3 Dieldrin 0.002
0-1 BIL
4-5 BIL
9-10 Hg 0.084 Cu 43 Zn 120
19-20 Cu 39 Zn 110
0-1 Hg 0.37
0-1 Zn 62
4-5 BIL
9-10 BIL
0-1 Cd 3.3 Cu 24 Zn 66
0-1 Zn 65
0-1 Cu 21
4-5 BIL
0-1 BIL
4-5 BIL
0-1 Hg 0.087
4-5 Cu 20
0-1 Aldrin 0.019 Isodrin 0.002 Dieldrin 0.54 Endrin 0.024
0-1 Dieldrin 0.3
2-3 BIL
Hg 0.084
0-1 Dieldrin 0.057
2-3 BIL
0-1 As 5.9 Hg 0.08
0-1 Cd 2.8
4-5 BIL
9-10 Cu 26
0-1 BIL
4-5 BIL
0-1 Hg 0.072
4-5 BIL
0-1 Hg 0.44
0-1 BIL
4-5 BIL
9-10 Zn 64 Cu 20
0-1 As 6.8 Hg 0.07
0-1 As 6.2 Hg 0.08
0-1 Aldrin 0.004 Dieldrin 0.18 Endrin 0.022
2-3 Dieldrin 0.007
0-1 BIL
0-1 As 5.7 Hg 0.08
0-1 Hg 0.079 Dieldrin 0.3
4-5 BIL
0-1 Aldrin 0.003 Dieldrin 0.096
0-1 Hg 0.062
4-5 Hg 0.062
9-10 BIL
14-15 Cu 57 Zn 81
19-20 Cu 34 Zn 68 Hg 0.10
24-25 Cu 34 Zn 86
0-1 BIL
4-5 BIL



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal Cleanup
Aberdeen Proving Ground, Maryland

SOURCE: HLA, 1987, ESE, 1987

FIGURE CSA-4-1

Phase I and Phase II Analytes Detected Within or Above Indicator Levels

Rocky Mountain Arsenal

Prepared by: Ebasco Services Incorporated

TABLE CSA-4-1
SOIL CONTAMINANT CONCENTRATIONS
FOR SITE CSA-4

Contaminant	Horizon 1 Max. (ug/g)	Horizon 1 Depth (ft)	Horizon 1 Boring Number	Horizon 2 Max. (ug/g)	Horizon 2 Depth (ft)	Horizon 2 Boring Number
Aldrin	0.019	0-1	3724	0.019	0-1	3724
Chlordane	0.27	0-1	3727	0.27	0-1	3727
PPDDE	0.012	0-1	3726	0.012	0-1	3726
PPDDT	0.014	0-1	3726	0.014	0-1	3726
Endrin	0.090	0-1	3726	0.090	0-1	3726
Dieldrin	0.59	0-1	3726	0.59	0-1	3726
Isodrin	0.006	0-1	3726	0.006	0-1	3726
Cadmium	3.3	0-1	3718	--	--	--
Copper	70	9-10	3267	--	--	--
Lead	60	4-5	3128	--	--	--
Mercury	1.2	Comp[1/] 0-1, 4-5	3012	--	--	--
Zinc	110	9-10	3270	--	--	--

1/ Comp Composite sample from 0-1 ft and 4-5 ft depth intervals.

CSA	Central Study Area
Max.	Maximum
ug/g	microgram per gram
ft	foot/feet

TABLE CSA-4-2

GROUNDWATER CONTAMINANT CONCENTRATIONS (UG/L)
FOR SITE CSA-4

AVERAGE SITE DEPTH TO GROUNDWATER: 25 Feet

CHEMICAL	CONCENTRATION MAXIMUM	LOCATION (WELL NUMBER)	SAMPLE DATE
1,1,1-TRICHLOROETHANE	3.1	36146	05/10/88
1,1-DICHLOROETHANE	2.4	36069	01/3/89
BENZENE	8.0	36069	01/3/89
CHLOROFORM	78	36069	02/12/88
CHLOROBENZENE	4.2	36069	02/12/88
DIISOPROPYLMETHYL PHOSPHONATE	0.91	36146	01/3/89
DITHIANE	6.8	36146	01/3/89
TETRACHLOROETHYLENE	2.1	36146	05/10/88
TRICHLOROETHYLENE	1.6	36075	02/8/88

EACH VALUE PRESENTED IS THE MAXIMUM CONCENTRATION FOR THE LISTED ANALYTE FOR THE PERIOD March 17, 1987 TO February 28, 1989.
DATA SOURCE: DP ASSOCIATES, RMA Database, July 19, 1990

CSA-4-3

EXPOSURE EVALUATIONS FOR REGULATED VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	9.5E+04	1.5E+00	1.3E-02	2.0E-07	1.3E-02	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-05
CHLORDANE	2.0E+01	1.0E+07	2.0E+01	1.4E-02	2.6E-08	1.4E-02	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	7.7E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.5E-05
PPDDE	7.4E+01	5.8E+06	7.4E+01	1.6E-04	2.1E-09	1.6E-04	0.0E+00
PPDDT	7.4E+01	1.2E+07	7.4E+01	1.9E-04	1.2E-09	1.9E-04	0.0E+00
1,1-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-09
DIELDRIN	1.6E+00	4.3E+04	1.6E+00	3.7E-01*	1.4E-05	3.7E-01*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	4.5E-11
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	3.5E+07	2.5E+03	3.6E-05	2.6E-09	3.6E-05	0.0E+00
ISODRIN	5.8E+02	6.9E+06	5.8E+02	1.0E-05	8.7E-10	1.0E-05	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	2.0E-06
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-09
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	3.0E-06
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.3E-03	0.0E+00	7.3E-03	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.7E-04	0.0E+00	1.7E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.9E-03	0.0E+00	3.9E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.6E-04	0.0E+00	3.6E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	5.5E-05	0.0E+00	5.5E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-4-4

EXPOSURE EVALUATIONS FOR CASUAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	1.5E+00	9.5E+04	1.5E+00	1.3E-02	2.0E-07	1.3E-02	0.0E+00
BENZENE	8.6E+02	0.0E+00	8.6E+02	0.0E+00	0.0E+00	0.0E+00	1.7E-05
CHLORDANE	2.0E+01	1.0E+07	2.0E+01	1.4E-02	2.6E-08	1.4E-02	0.0E+00
CHLOROBENZENE	1.6E+05	0.0E+00	1.6E+05	0.0E+00	0.0E+00	0.0E+00	7.7E-08
CHLOROFORM	4.0E+03	0.0E+00	4.0E+03	0.0E+00	0.0E+00	0.0E+00	2.5E-05
PPDDE	7.4E+01	5.8E+06	7.4E+01	1.6E-04	2.1E-09	1.6E-04	0.0E+00
PPDDT	7.4E+01	1.2E+07	7.4E+01	1.9E-04	1.2E-09	1.9E-04	0.0E+00
1,1-DICHLOROETHANE	2.8E+02	0.0E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-09
DIELDRIN	1.6E+00	4.3E+04	1.6E+00	3.7E-01*	1.4E-05	3.7E-01*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.6E+05	0.0E+00	6.6E+05	0.0E+00	0.0E+00	0.0E+00	4.5E-11
DITHIANE	8.3E+04	0.0E+00	8.3E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+03	3.5E+07	2.5E+03	3.6E-05	2.6E-09	3.6E-05	0.0E+00
ISODRIN	5.8E+02	6.9E+06	5.8E+02	1.0E-05	8.7E-10	1.0E-05	0.0E+00
TETRACHLOROETHYLENE	5.1E+02	0.0E+00	5.1E+02	0.0E+00	0.0E+00	0.0E+00	2.0E-06
1,1,1-TRICHLOROETHANE	7.5E+05	0.0E+00	7.5E+05	0.0E+00	0.0E+00	0.0E+00	4.0E-09
TRICHLOROETHYLENE	2.3E+03	0.0E+00	2.3E+03	0.0E+00	0.0E+00	0.0E+00	3.0E-06
CADMIUM	4.5E+02	0.0E+00	4.5E+02	7.3E-03	0.0E+00	7.3E-03	0.0E+00
COPPER	4.2E+05	0.0E+00	4.2E+05	1.7E-04	0.0E+00	1.7E-04	0.0E+00
LEAD	1.5E+04	0.0E+00	1.5E+04	3.9E-03	0.0E+00	3.9E-03	0.0E+00
MERCURY	3.3E+03	0.0E+00	3.3E+03	3.6E-04	0.0E+00	3.6E-04	0.0E+00
ZINC	2.0E+06	0.0E+00	2.0E+06	5.5E-05	0.0E+00	5.5E-05	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-4-5

EXPOSURE EVALUATIONS FOR RECREATIONAL VISITORS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN
ALDRIN	2.1E-01	6.3E+03	2.1E-01	9.2E-02	3.0E-06	9.2E-02	0.0E+00
BENZENE	1.2E+02	0.0E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	2.6E-04
CHLORDANE	2.7E+00	6.8E+05	2.7E+00	1.0E-01	4.0E-07	1.0E-01	0.0E+00
CHLOROBENZENE	6.8E+04	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	5.0E-07
CHLOROFORM	5.6E+02	0.0E+00	5.6E+02	0.0E+00	0.0E+00	0.0E+00	3.8E-04
PPDDE	1.0E+01	3.8E+05	1.0E+01	1.2E-03	3.1E-08	1.2E-03	0.0E+00
PPDDT	1.0E+01	8.0E+05	1.0E+01	1.4E-03	1.7E-08	1.4E-03	0.0E+00
1,1-DICHLOROETHANE	3.9E+01	0.0E+00	3.9E+01	0.0E+00	0.0E+00	0.0E+00	2.1E-08
DIELDRIN	2.2E-01	2.9E+03	2.2E-01	2.7E+00*	2.0E-04	2.7E+00*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	2.8E+05	0.0E+00	2.8E+05	0.0E+00	0.0E+00	0.0E+00	2.9E-10
DITHIANE	3.5E+04	0.0E+00	3.5E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.1E+03	5.4E+06	1.1E+03	8.5E-05	1.7E-08	8.5E-05	0.0E+00
ISODRIN	2.5E+02	1.1E+06	2.5E+02	2.4E-05	5.6E-09	2.4E-05	0.0E+00
TETRACHLOROETHYLENE	7.1E+01	0.0E+00	7.1E+01	0.0E+00	0.0E+00	0.0E+00	3.0E-05
1,1,1-TRICHLOROETHANE	3.2E+05	0.0E+00	3.2E+05	0.0E+00	0.0E+00	0.0E+00	2.6E-08
TRICHLOROETHYLENE	3.2E+02	0.0E+00	3.2E+02	0.0E+00	0.0E+00	0.0E+00	4.5E-05
CADMIUM	5.8E+01	0.0E+00	5.8E+01	5.7E-02	0.0E+00	5.7E-02	0.0E+00
COPPER	2.5E+05	0.0E+00	2.5E+05	2.8E-04	0.0E+00	2.8E-04	0.0E+00
LEAD	9.2E+03	0.0E+00	9.2E+03	6.5E-03	0.0E+00	6.5E-03	0.0E+00
MERCURY	2.0E+03	0.0E+00	2.0E+03	6.1E-04	0.0E+00	6.1E-04	0.0E+00
ZINC	1.1E+06	0.0E+00	1.1E+06	1.0E-04	0.0E+00	1.0E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

CSA-4-6

EXPOSURE EVALUATIONS FOR COMMERCIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT PPLV (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI EMC
ALDRIN	1.9E+00	4.0E-01	3.3E-01	1.0E-02	4.8E-02	5.8E-02	0.0E+00
BENZENE	1.1E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	0.0E+00	2.4E-02
CHLORDANE	2.5E+01	1.4E+04	2.5E+01	1.1E-02	2.0E-05	1.1E-02	0.0E+00
CHLOROBENZENE	8.8E+04	0.0E+00	8.8E+04	0.0E+00	0.0E+00	0.0E+00	3.2E-04
CHLOROFORM	5.1E+03	0.0E+00	5.1E+03	0.0E+00	0.0E+00	0.0E+00	3.5E-02
PPDDE	9.3E+01	1.9E+01	1.6E+01	1.3E-04	6.2E-04	7.5E-04	0.0E+00
PPDDT	9.3E+01	1.9E+01	1.6E+01	1.5E-04	7.2E-04	8.7E-04	0.0E+00
1,1-DICHLOROETHANE	3.6E+02	0.0E+00	3.6E+02	0.0E+00	0.0E+00	0.0E+00	1.9E-06
DIELDRIN	2.0E+00	5.8E+01	1.9E+00	3.0E-01*	1.0E-02	3.1E-01*	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	3.7E+05	0.0E+00	3.7E+05	0.0E+00	0.0E+00	0.0E+00	1.9E-07
DITHIANE	4.6E+04	0.0E+00	4.6E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	1.4E+03	2.9E+02	2.4E+02	6.5E-05	3.1E-04	3.8E-04	0.0E+00
ISODRIN	3.2E+02	6.7E+01	5.5E+01	1.9E-05	8.9E-05	1.1E-04	0.0E+00
TETRACHLOROETHYLENE	6.5E+02	0.0E+00	6.5E+02	0.0E+00	0.0E+00	0.0E+00	2.7E-03
1,1,1-TRICHLOROETHANE	4.2E+05	0.0E+00	4.2E+05	0.0E+00	0.0E+00	0.0E+00	1.7E-05
TRICHLOROETHYLENE	2.9E+03	0.0E+00	2.9E+03	0.0E+00	0.0E+00	0.0E+00	4.1E-03
CADMIUM	3.6E+02	0.0E+00	3.6E+02	9.2E-03	0.0E+00	9.2E-03	0.0E+00
COPPER	1.8E+05	0.0E+00	1.8E+05	4.0E-04	0.0E+00	4.0E-04	0.0E+00
LEAD	6.5E+03	0.0E+00	6.5E+03	9.2E-03	0.0E+00	9.2E-03	0.0E+00
MERCURY	1.4E+03	0.0E+00	1.4E+03	8.6E-04	0.0E+00	8.6E-04	0.0E+00
ZINC	7.8E+05	0.0E+00	7.8E+05	1.4E-04	0.0E+00	1.4E-04	0.0E+00

*: EI is equal to or exceeds 1.0E-01

CSA-4-7

EXPOSURE EVALUATIONS FOR INDUSTRIAL WORKERS

CONTAMINANT	DIRECT PPLV (mg/kg)	INDIRECT OSVI (mg/kg)	INDIRECT ESVI (mg/kg)	CUMULATIVE PPLV (mg/kg)	DIRECT EI	INDIRECT EI	CUMULATIVE EI	VEI OPN	VEI ENC
ALDRIN	1.2E-01	1.3E+04	4.0E-01	9.0E-02	1.6E-01*	4.8E-02	2.1E-01*	0.0E+00	0.0E+00
BENZENE	6.7E+01	0.0E+00	0.0E+00	6.7E+01	0.0E+00	0.0E+00	0.0E+00	1.3E-04	7.1E-02
CHLORDANE	1.5E+00	1.4E+06	5.2E+00	1.2E+00	1.8E-01*	5.2E-02	2.3E-01*	0.0E+00	0.0E+00
CHLOROBENZENE	1.5E+04	0.0E+00	0.0E+00	1.5E+04	0.0E+00	0.0E+00	0.0E+00	5.7E-07	3.2E-04
CHLOROFORM	3.1E+02	0.0E+00	0.0E+00	3.1E+02	0.0E+00	0.0E+00	0.0E+00	1.9E-04	1.0E-01
PPDDE	5.7E+00	7.7E+05	1.9E+01	4.4E+00	2.1E-03	6.2E-04	2.7E-03	0.0E+00	0.0E+00
PPDDT	5.7E+00	1.6E+06	1.9E+01	4.4E+00	2.4E-03	7.2E-04	3.2E-03	0.0E+00	0.0E+00
1,1-DICHLOROETHANE	2.3E+01	0.0E+00	0.0E+00	2.3E+01	0.0E+00	0.0E+00	0.0E+00	1.0E-08	5.8E-06
DIELDRIN	1.2E-01	5.8E+03	1.9E+01	1.2E-01	4.8E+00*	3.1E-02	4.9E+00*	0.0E+00	0.0E+00
DIISOPROPYLMETHYL PHOSPHONATE	6.8E+04	0.0E+00	0.0E+00	6.8E+04	0.0E+00	0.0E+00	0.0E+00	3.3E-10	1.9E-07
DITHIANE	8.5E+03	0.0E+00	0.0E+00	8.5E+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENDRIN	2.5E+02	4.7E+06	8.6E+02	2.0E+02	3.5E-04	1.0E-04	4.6E-04	0.0E+00	0.0E+00
ISODRIN	5.9E+01	9.2E+05	2.0E+02	4.6E+01	1.0E-04	3.0E-05	1.3E-04	0.0E+00	0.0E+00
TETRACHLOROETHYLENE	4.1E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	1.5E-05	8.2E-03
1,1,1-TRICHLOROETHANE	7.8E+04	0.0E+00	0.0E+00	7.8E+04	0.0E+00	0.0E+00	0.0E+00	3.0E-08	1.7E-05
TRICHLOROETHYLENE	1.8E+02	0.0E+00	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	2.2E-05	1.2E-02
CADMIUM	7.6E+00	0.0E+00	0.0E+00	7.6E+00	4.3E-01*	0.0E+00	4.3E-01*	0.0E+00	0.0E+00
COPPER	5.7E+04	0.0E+00	0.0E+00	5.7E+04	1.2E-03	0.0E+00	1.2E-03	0.0E+00	0.0E+00
LEAD	2.2E+03	0.0E+00	0.0E+00	2.2E+03	2.7E-02	0.0E+00	2.7E-02	0.0E+00	0.0E+00
MERCURY	4.6E+02	0.0E+00	0.0E+00	4.6E+02	2.6E-03	0.0E+00	2.6E-03	0.0E+00	0.0E+00
ZINC	1.4E+05	0.0E+00	0.0E+00	1.4E+05	7.9E-04	0.0E+00	7.9E-04	0.0E+00	0.0E+00

*: *EI is equal to or exceeds 1.0E-01*

If the PPLV value indicated is greater than 1.00E+06 the calculations imply that the contaminant does not pose unacceptable chronic exposure through the exposure pathway considered, even in its pure form.

3.0 STUDY AREA EXPOSURE SUMMARY

The exposure assessment results for the CSA at RMA are summarized in Table 3-1. Of the 10 sites evaluated, 7 sites were designated as Priority 1 sites based on the most sensitive exposed population PPLV (i.e., the industrial worker). These include:

- Pesticide Pit (CSA-1a)
- Complex Disposal Area South (CSA-1b)
- Complex Disposal Area North (CSA-1c)
- Sanitary Landfill and Incinerator 834 (CSA-1d)
- Munitions Test Buildings (CSA-2a)
- Parking Lot/Scrap Storage (CSA-2b)
- Section 36 - Low-Level OCP Detection (CSA-4)

Three sites were designated as Priority 2 sites based on the most sensitive exposed population PPLV (i.e., the industrial worker). These include:

- Munitions Test Site (CSA-2c)
- Incinerator NN3601 (CSA-2d)
- Chemical Sewer - North Plants (CSA-3)

The COCs in soils (i.e., those displaying an EI greater than 0.1) for the CSA, based on the most sensitive exposed population PPLV (i.e., the industrial worker), are:

- Aldrin
- Benzene
- Benzothiazole
- Bicycloheptadiene
- Carbon tetrachloride
- Chlordane
- Chloroacetic acid
- Chloroform
- Chlorophenylmethyl sulfide
- Dibromochloropropane
- PPDDE

- PPDDT
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Dicyclopentadiene
- Dieldrin
- Dimethyldisulfide
- Endrin
- Fluoroacetic acid
- Hexachlorocyclopentadiene
- Isodrin
- Methylene chloride
- Methylisobutyl ketone[1/]
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead

The groundwater COSs (i.e., those displaying a VEI greater than 1.0) for the CSA are:

- Benzene
- Carbon tetrachloride
- Chloroform
- Dibromochloropropane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Trichloroethylene

[1/] Identified as a COC for the commercial worker only (see Volume VII, Section 4.2).

TABLE CSA-3-1
NUMBER OF EXCEEDANCES FOR CONTAMINANTS OF CONCERN
IN THE CENTRAL STUDY AREA

Contaminant of Concern	Number of Exceedances
Aldrin	6
Benzene	2
Benzothiozole	1
Bicycloheptadiene	1
Carbon tetrachloride	1
Chlordane	4
Chloroacetic acid	1
Chloroform	1
Chlorophenylmethyl sulfide	1
PPDDE	3
PPDDT	1
Dibromochloropropane	3
1,2-Dichloroethane	1
1,1-Dichloroethylene	1
Dicyclopentadiene	1
Dieldrin	7
Dimethyldisulfide	1
Endrin	1
Fluoroacetic acid	5
Hexachlorocyclopentadiene	2
Isodrin	1
Methylene chloride	3
Methylisobutyl ketone[1/]	1
1,1,2,2-Tetrachloroethane	1
Tetrachloroethylene	2
Arsenic	3
Cadmium	5
Chromium	1
Copper	1
Lead	1

1/ Identified as a COC for the commercial worker only (see Volume VII, Section 4.2).

4.0 REFERENCES

RIC 88357R01

EBASCO (Ebasco Services Incorporated). 1988a. Proposed Final Rocky Mountain Arsenal Chemical Index Volumes I-II. August 1988. Contract No. DAAK11-84-D0017. Prepared for: U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88286R08

EBASCO. 1988b. Final Phase I Contamination Assessment Report. Chemical Sewers, North Plants and South Plants. Version 3.2. September 1988. Task No. 10. Contract No. DAAK11-84-D-0017. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

EBASCO. 1989a. Final Remedial Investigation Report. Volume X. Central Study Area. Version 3.3. July 1989. Contract No. DAAA15-88-D-0024. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 87203R01

ESE (Environmental Science and Engineering, Inc.). 1987. Final Phase I Contamination Assessment Report. Site 36-3: Insecticide Pit. Version 3.3. June 1987. Task No. 1 -Section 36. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 87203R01A

ESE. 1988a. Final Phase II Data Addendum. Site 36-3: Insecticide Pit. Version 3.1. September 1988. Task No. 1. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88013R05

ESE. 1988b. Final Phase I Contamination Assessment Report. Site 36-17: Complex Disposal Activity. Version 3.2. January 1988. Task No. 1 - Section 36. Contract No. DAAK11-84-D-0017. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88013R05A

ESE. 1988c. Final Phase II Data Addendum. Site 36-17: Complex Disposal Activity. Version 3.1. September 1988. Task No. 1. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88293R08

ESE. 1988d. Final Phase I Contamination Assessment Report. Site 36-16: Incendiary Burial Site. Version 3.2. September 1988. Task No. 14 - Army Sites North. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88293R05
ESE. 1988e. Final Phase I Contamination Assessment Report. Site 36-9: Incendiary or Munition Test Area. Version 3.3. September 1988. Task No. 14 - Army Sites North. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R07
ESE. 1988f. Final Phase I Contamination Assessment Report. Site 36-7: Solid Waste Burial/Sanitary Pits. Version 3.1. February 1988. Task No. 1 - Section 36. Contract No. DAAK11-84-D-0017. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R07A
ESE. 1988g. Final Phase II Data Addendum. Site 36-7: Solid Waste Burial/Sanitary Pit. Version 3.1. September 1988. Task No. 1. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R04
ESE. 1988h. Final Phase I Contamination Assessment Report. Site 36-2: Munitions Test Area and Incendiary Drop Site. Version 3.2. February 1988. Task No. 14 - Army Sites North. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R04A
ESE. 1988i. Final Phase II Data Addendum. Site 36-2: Munitions Test Area and Incendiary Drop Site. Version 3.1. September 1988. Task No. 14. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88173R04
ESE. 1988j. Final Phase I Contamination Assessment Report. Site 36-23: Scrap Metal Storage/Parking Lot. Version 3.1. May 1988. Task No. 14 - Army Sites North. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88173R04A
ESE. 1988k. Final Phase II Data Addendum. Site 36-23: Scrap Metal Storage/Parking Lot. Version 3.1. August 1988. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R05
ESE. 1988l. Final Phase I Contamination Assessment Report. Site 36-6/25-17: Probable Test Site with Trench. Version 3.2. February 1988. Task No. 14 - Army Sites North. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88063R05A
ESE. 1988m. Final Phase II Data Addendum. Site 36-6/25-17: Probable Test Site with Trench. Version 3.1. September 1988. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

RIC 88173R01
ESE. 1988n. Final Phase I Contamination Assessment Report. Section 36 - Nonsource Area. Version 3.2. May 1988. Task No. 1. Contract No. DAAK11-84-D-0016. Prepared for U.S. Army Program Manager's Office for RMA Contamination Cleanup.

APPENDIX A
NONTARGET SCREENING

NONTARGET SCREENING

A number of nontarget contaminants were originally identified through a screen (i.e., toxicity, concentration, frequency of occurrence) of the nontarget fraction of the Phases I and II RI data as part of the RMA Chemical Index (EBASCO, 1988a/RIC88357R01). These contaminants were carried through to the exposure assessment where an additional screening was performed to determine whether PPLVs should be developed for each of the site-specific nontarget contaminants. Development of PPLVs for these contaminants was based on four screening criteria, namely, frequency of occurrence, similarity of the nontarget concentration to that of target contaminants, suspicion that the detection was a laboratory contaminant, and co-occurrence of nontargets with targets in Arsenal soils (see Volume VI-A, Section 2.2.3.1).

The results of the nontarget evaluations for each site of Central Study Area, their screening parameters, and the decision to further consider or reject them, are presented in Table A-1.

TABLE A-1
CENTRAL STUDY AREA NONTARGET SCREENING

Site	Nontarget Contaminant	Frequency of Occurrence	Relative Concentration	Suspected Lab Contam.	Co-occurs with Drivers	Nontarget Decision
CSA-1a	Hexachlorobenzene	Moderate	Low	No	Yes	Reject
	Hexachlorobutadiene	Moderate	Moderate	No	Yes	Reject
	4-Hydroxy-4-methyl-2-pentanone	Low	Low	No	Yes	Reject
	Methyl cyclohexane	Low	Moderate	No	Yes	Reject
	Methyl phosphonic acid	Low	Low	No	Yes	Reject
	Pentachlorobenzene	Low	Moderate	No	Yes	Reject
	Tetrachlorobenzene	Low	Low	No	Yes	Reject
	Trichloropropene	Low	Low	No	Yes	Reject
CSA-1c	Fluoranthene	Low	Low	No	Yes	Reject
	Hexachlorobenzene	Low	Low	No	Yes	Reject
	Methyl phosphonic acid	Low	Low	No	Yes	Reject
	Pentachlorobenzene	Low	Low	No	Yes	Reject
	Phenanthrene	Low	Low	No	Yes	Reject
	Pyrene	Low	Low	No	Yes	Reject
	1,1,2,2-Tetrachloroethane	Low	Moderate	Yes	Yes	Reject[1/]
	Trichlorobenzene	Low	Low	No	Yes	Reject
	Trichloropropene	Low	Low	No	Yes	Reject
CSA-1d	Pyrene	Low	Low	No	Yes	Reject
CSA-2b	Fluoranthene	Low	Moderate	No	Yes	Reject
	Pyrene	Low	Moderate	No	Yes	Reject
CSA-2c	Benzothiazole	Low	Low	No	Yes	Reject
CSA-3	Methyl cyclohexane	Low	Low	No	Yes	Reject

1/ Although rejected, PPLVs are computed for this chemical since it was detected in the Central Study Area.

APPENDIX B
CENTRAL STUDY AREA

Appendix B
Central Study Area

Three sites in this study area had exceedances of the open space vapor inhalation pathway: CSA-1a, CSA-1b, and CSA-1c. According to the methodology presented in Volume IV, Section 4.5.8, the representative exposure index (EI_{REP}) was calculated using the mean soil contaminant concentration at the site for the specific contaminant(s) in question.

The mean soil contaminant concentrations were calculated as the geometric mean of the hits for contaminants with less than 30 percent hits and the adjusted geometric mean of the hits for contaminants with greater than 30 percent hits. This procedure was adopted to ensure the most conservative computation of the mean values.

The EI_{REP} was then calculated using the lowest open space SPPPLV calculated for a particular contaminant at the site. The open space SPPPLVs used were either recreational (Rec) and industrial (Ind). EI_{REP}'s with values greater than 0.1 are exceedances and are designated with an asterisk. The sites, contaminants, SPPPLVs, mean concentrations, and EI_{REP}'s are listed in Table B-1.

For the contaminants with EI_{REP} exceedances, the distances from the center of the site to the nonattainment boundary were calculated. These distances, D_{CRIT}'s, are listed in Table B-2.

TABLE B-1
CENTRAL STUDY AREA EI_{REP}'s

Site	Contaminant	SPPPLV (ug/kg)		Mean Concentrations (ug/kg)	EI_{REP}
CSA-1a	DBCP	640	Ind	0.72	1.1×10^{-3}
CSA-1b	DBCP	0.35	Rec	0.04	0.11*
CSA-1c	Aldrin	2,000	Rec	0.22	1.1×10^{-4}
	Dieldrin	900	Rec	0.46	5.1×10^{-4}
	Hexachloro-cyclopentadiene	82	Rec	4.4	0.050
	Tetrachlo-ethylene	1,900	Ind	32	0.017
	1,1,2,2-Tetra-chloroethane	27	Ind	15	0.56*

* Exceedance

TABLE B-2
CENTRAL STUDY AREA D_{CRIT}'s

Site	Contaminant	D_{CRIT} (m)
CSA-1b	DBCP	650
CSA-1c	1,1,2,2-Tetra-chloroethane	979